WORLD PETROLEUM

SEPTEMBER 1954 INTERNATIONAL REVIEW ISSUE

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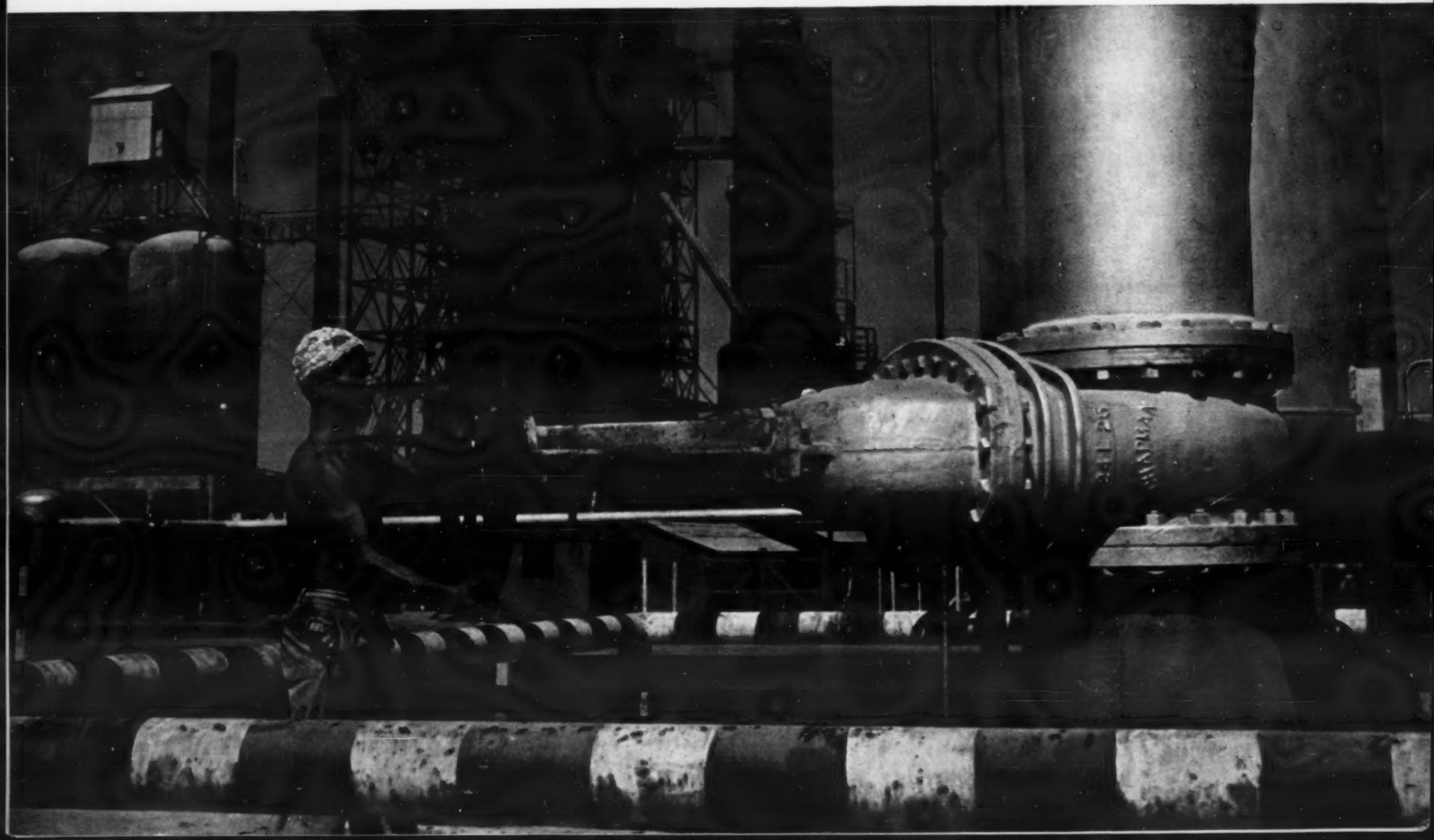

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Make certain your Motor Fuel loses none of its high quality before or after it gets into the customer's tank.

Blending with NATURAL GASOLINE will "season" your product with RETAINED VOLATILITY.

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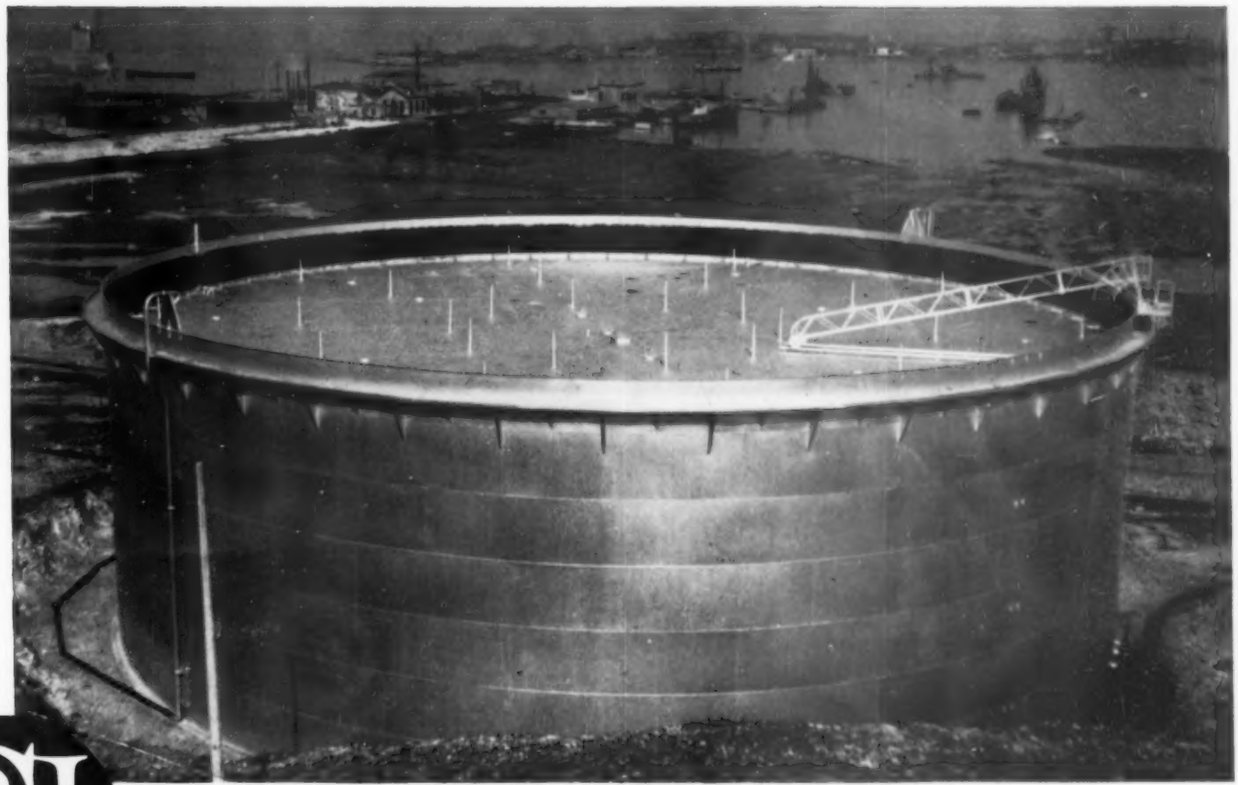
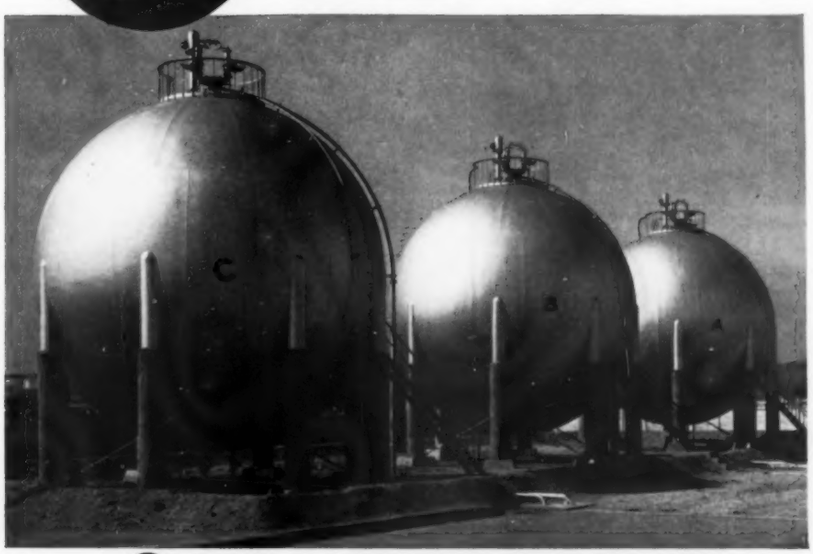


VOLATILE LIQUID STORAGE
TO SAVE YOU MONEY . . .



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Efficient storage and handling of crude oil, gasoline, and similar volatile liquids requires modern storage equipment. Horton® Floating Roofs installed in flat bottom storage tanks reduce evaporation losses, corrosion and fire hazard. Floating directly on the surface, the entire bottom of the roof is normally in contact with the liquid leaving no air-vapor mixture above the liquid to be vented and lost. Horton Floating Roofs are built in three types: Double-Deck, Pontoon and Pan.

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Hortonspheres® are used to store the more volatile grades of natural gasoline, butane, butane-propane mixtures and refinery stocks of similar volatility. They are designed to operate at sufficient pressure to prevent practically all evaporation loss. Maintenance of a Hortonsphere is simple with only an annual inspection and painting normally being required. They are built in sizes to 30,000 bbls. and for pressures to 217 lbs. per sq. in. in the smaller capacities.

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GLASS JET *PERFORATOR!*

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FOR BEST RESULTS LOG AND PERFORATE BY McCULLOUGH

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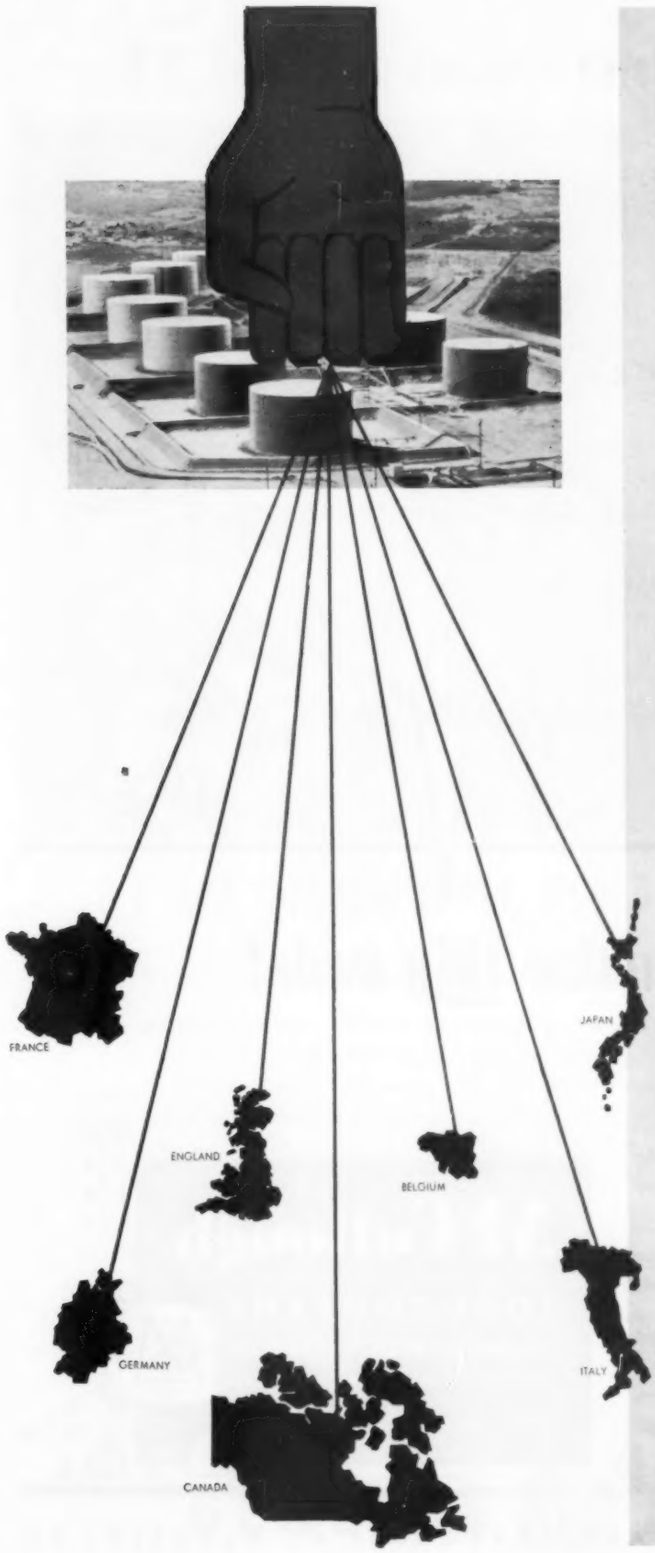

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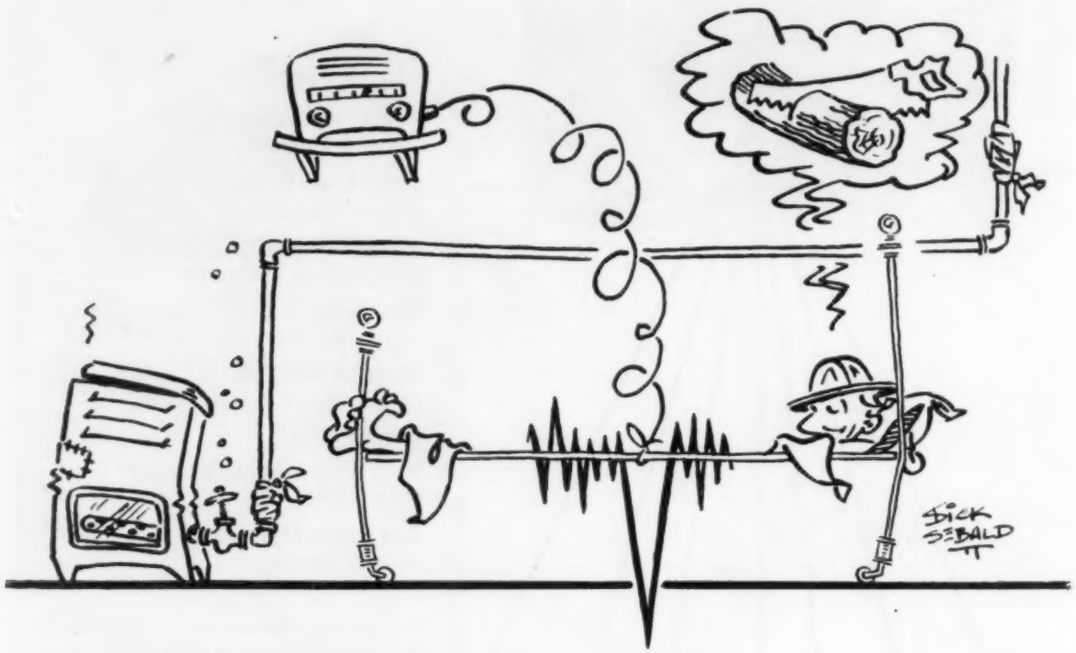

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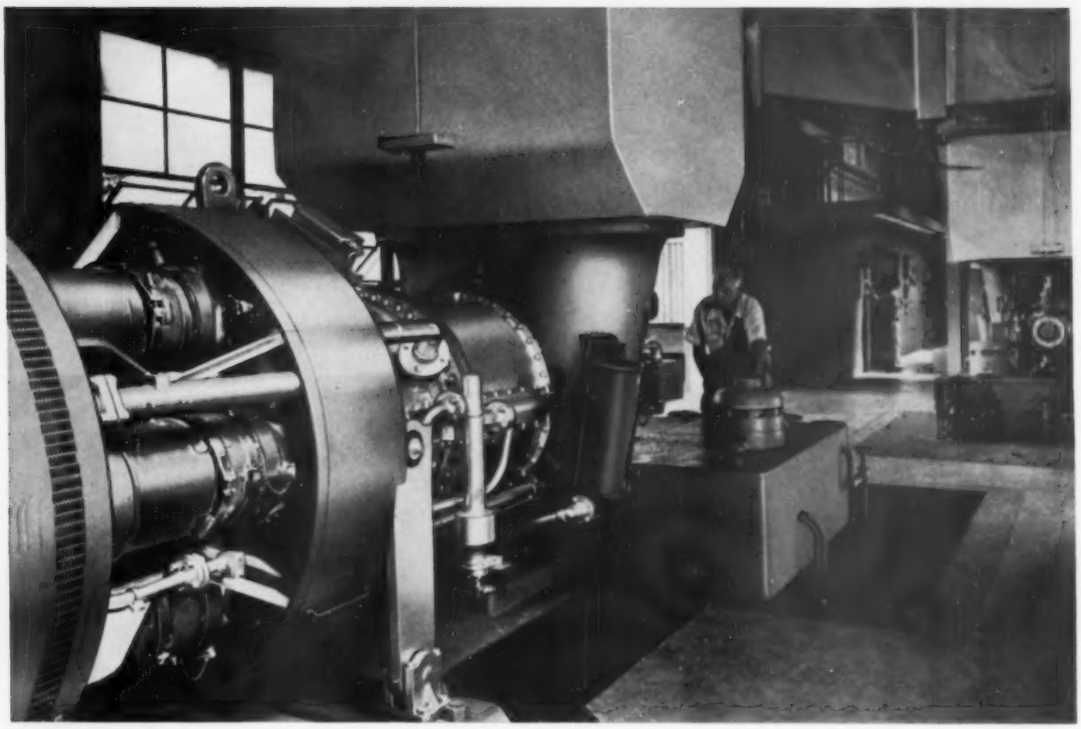

G-E GAS TURBINES SET WORLD OPERATING RECORD

If you plan new power in your plant, consider these performance facts and figures:

WORLD'S RECORD. There are now 70 G-E gas turbines in operation. They have delivered more than 350,000 hours of service, equal to 40 machine years. This is a world's record. At one utility, a G-E unit has had only 34 hours of unscheduled downtime during more than 31,000 operational hours. Another has had none at all in 9,000 hours. A natural-gas firm, after its gas turbine's initial tune-up, has had less than 1% downtime due to mechanical or electrical failure. Gas Turbine electric locomotives have logged 1,750,000 miles.

EXTRA HORSEPOWER. Gas turbines are cheaper to run, cost less to install. They require little maintenance and manpower to run them. Semi-automatic and self-protecting, gas turbines provide up to 25% additional horsepower at lower ambient temperatures. Learn the value of the gas turbine to your plant. Consult your nearest G-E representative. *International General Electric Company, Apparatus Sales, 570 Lexington Ave., New York 22, N.Y., U.S.A.* 1A-54-16

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How many times has a glove like this on the hand of a maintenance worker gripped a wrench to repair a valve in your plant? How many of those times could have been avoided if the valves had been better ones from the start?

The big advantage of quality valves like Crane is in the performance they deliver *with less maintenance*. Just one repair job can, and often does, cost many times the difference in price between a "bargain" valve and a Crane quality valve.

So today as you seek ever more intently for ways to cut costs, look for the kind of valve dependability that cuts down your piping upkeep. Buy better for lower ultimate cost. That's *always* real thrift. It's the reason why so many Crane valves and fittings are going into service today.

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VALVES • FITTINGS • PIPE • PLUMBING • HEATING

KNOWLEDGE
a power for good

The Standard-Vacuum organization is continually expanding its educational and training programs for its 40,000 employees in the various areas where it operates.

In Indonesia, for example, 71 formal training courses as well as on-the-job instruction are giving several thousand men new skills . . . teaching them to work as a team and to produce more . . . improving their ability to shoulder responsibility . . . adding to their economic security as individuals and their economic strength as citizens.

Stanvac seeks to do its part in developing the capacities of its employees so that they become better qualified to carry on the company's operations and to participate in supervisory and administrative functions.

Greater knowledge is truly a power for good.

STANDARD-VACUUM OIL COMPANY

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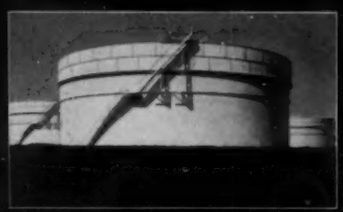
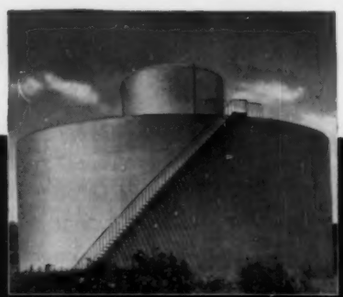
GRAVERSPHERES are used to store natural gasolines and volatile liquids including butane, butadiene, etc. They are ideal for storing gases—sustaining pressures up to 100 psi. and greater. Capacities range from 500 to 20,000 bbl.



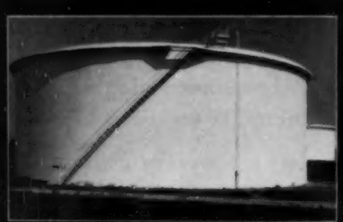
GRAVER EXPANSION ROOF TANK eliminates breathing losses and minimizes filling losses. Its positive liquid seal, exclusive with Graver, protects under all conditions. Ideal for converting existing tankage, and simple to maintain, the Expansion Roof Tank may well protect an entire terminal.

there is a GRAVER CONSERVATION DESIGN to fit every need!

Graver manufactures a number of conservation designs allowing you to specify what suits your exact needs. Thus your tankage can be "tailor-made" to obtain optimum efficiency and maximum economy in operation. For authoritative assistance with your conservation problems, consult your nearest Graver Sales Engineer.



GRAVER VAPOR-MIZER is an economical design that conserves vapors, using less steel in building and requiring smaller vapor lines in manifolded tankage.
The VAPOR-MIZER helps maintain the fresh quality of your product! As it operates at very low pressures, the reinforcement of manifolded tanks becomes unnecessary.



GRAVER DOUBLE-DECK AND CENTER-WEIGHTED FLOATING ROOF TANKS are two separate designs in which the roof floats directly on the liquid, preventing the formation of vapors. They are applicable to crude and product storage areas at refineries, terminals and large bulk installations.

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SIE

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THE SIE MR-4 RECORDER

The SIE MR-4 Magnetic Recorder heralds the newest advance in seismic techniques . . . automatic data-reduction. With seismic information translated to electrical signals and permanently stored on magnetic tape, a new interpreting medium is open to the exploration geophysicist. Records may be taken at different charge depths at the same shot-point and the stored information integrated electrically . . . or series of records from different shot or spread locations can be composited and the resolved information presented on one record. The combinations are almost limitless and the advent of a practical field recorder, the MR-4, opens this whole field of data-reduction interpretation to the industry.

Yet the equipment offered by SIE for the permanent storage of seismic information provides the same ease of operation and famous dependability as conventional systems. Actually, the MR-4 is, in many respects, less complex. The magnetic tape can be loaded or removed in less than 10 seconds. One operating control is used for recording or playback functions. The MR-4 with Direct-Viewer (optional) presents the record for immediate viewing on a fluorescent screen . . . thus establishing the usefulness of the records *at the field location.*

Wide-Range, Low Distortion, Operating Simplicity, and extremely Low Noise-Level are among the outstanding characteristics of the MR-4 Magnetic Recorder . . . designed to meet the specific requirements of the ***Seismic Industry*** by SIE, "The World's Leading Manufacturer of Exploration Seismograph Systems."

Frequency Range — DC to 500 CPS • Noise Level — down 56 db from one volt • Distortion — less than 1% • Record Length — 5 to 5½ seconds • Tape Speed — 7½ in/sec • Channels — 28 including timing Power Source — 12 volts DC • Dimensions — 19⅛ x 19⅞ x 14⅛ • Weight — 115 pounds (with Viewer)

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ENGLAND—Another Caltex tanker slips down the ways to join her sister ships in transporting vital crude oil and finished petroleum products to ports and markets of the free world. In commissioning these tankers and training their crews, Caltex gives employment opportunities to many . . . helps strengthen England's economy.

EGYPT—Transportation facilities in the principal cities of the "Land of the Pharaohs" are strictly up to date. To motorists and fleet owners, modern Caltex service stations—like this one in Cairo—offer the latest in automotive products . . . and the efficient service that brings back old customers and attracts a constant flow of new friends.

Caltex serves the people of 67 lands

In 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.

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How much are Standard's owners paid?

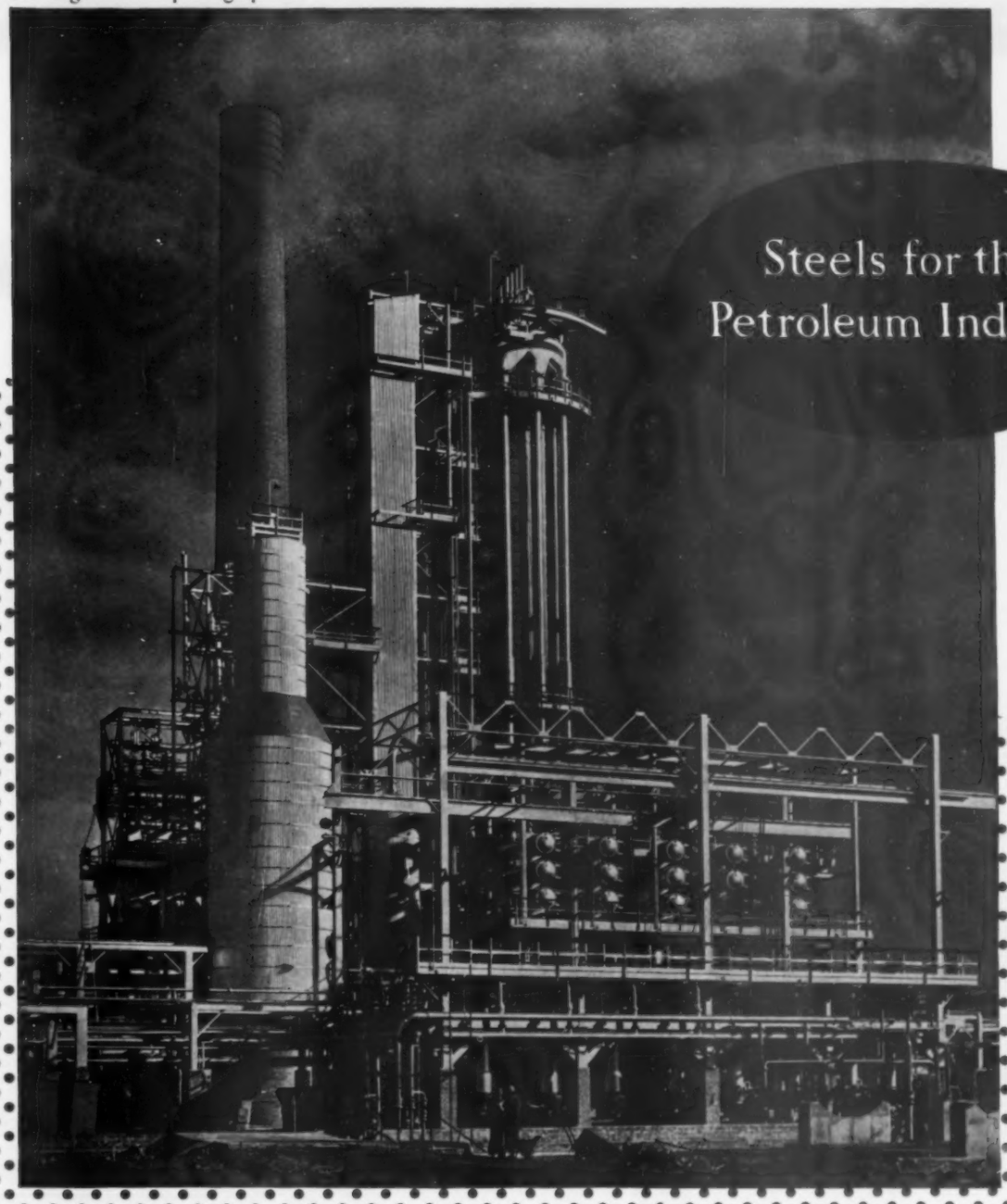
75 years ago one of the companies from which Standard Oil Company of California grew was formed by five men. In those days smaller communities and simpler needs could be served by concerns owned by one man or a small group. They furnished all the money—they kept all the profit, too. But the West grew tremendously, and we've grown up with the West.

Today, no one man could pay for all the oil fields, refineries, and other equipment Standard needs to serve you well. These investments are shared among Standard's 112,000 owners. About 97% of these shareholders are private individuals like you—including 12,000 Standard employees, our largest single group of owners. In addition, 293 schools and universities are owners of Standard, along with 224 churches and religious organizations, 165 hospitals and medical groups, and 1889 small and large businesses. These are our sole proprietors—we are neither owned nor controlled by any of the Standard companies in the East. Like the proprietors of any company, these shareholders receive the profits from their business. Each dollar they have in Standard is now earning approximately 10¢ a year. Only about 5¢ of this is paid to them in cash. The remainder is plowed back into the business to bring you even better products and services . . . to stay ahead of competition and keep pace with your needs.

STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better

An Anglo-Iranian photograph



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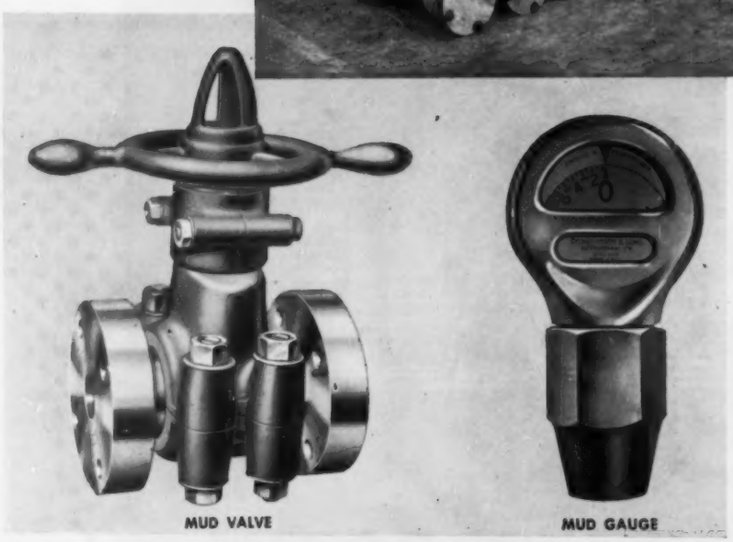
FOR THE OIL AND ALLIED INDUSTRIES



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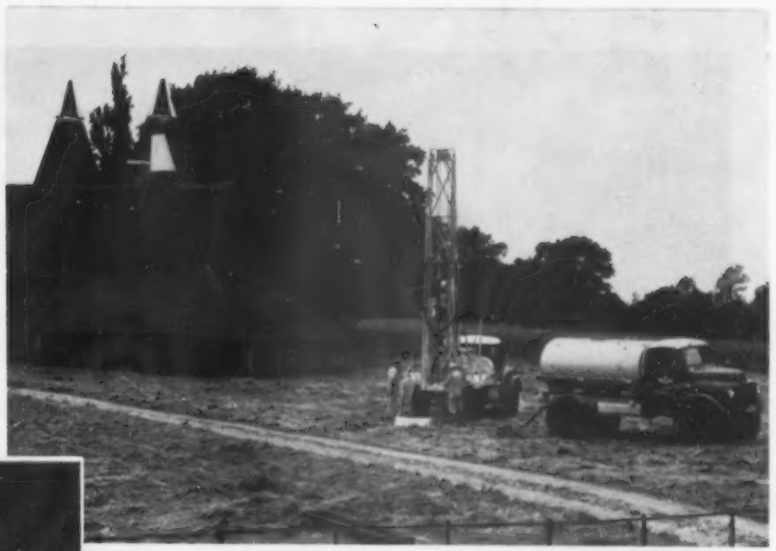
OIL
MUST BE DISCOVERED



S.S.L. drill and water truck at Chiddingstone, Kent. Oast houses shown in the background.

On a remote and lonesome overseas assignment a geophysicist may dream of a tour in the United Kingdom with the day ending in the traditional atmosphere of an ancient country pub. Luckily for him the search for oil and natural gas provides that opportunity. Yet, once he is at work in the United Kingdom, he misses the open spaces of the desert or the dense jungle where he can cut his way through as he pleases.

Here, he is faced with physical obstacles: hedgerows, cattle, crops, railways, etc.; also interferences with instruments from industrial noises, electrical lines, and not least of all the numerous aircraft flying overhead. All this demands frequent changes of operational technique.

To meet these problems Seismograph Service Limited can draw on its *world-wide experience* and also on the knowledge and research organization of Seismograph Service Corporation of U. S. A., with its associate companies — Seismograph Service Corporation of Canada, Venezuela, Mexico and Colombia, and Compagnie Francais de Prospection Sismique of France.

Seismograph Service Limited is prepared to undertake seismic exploration under the most difficult of conditions.

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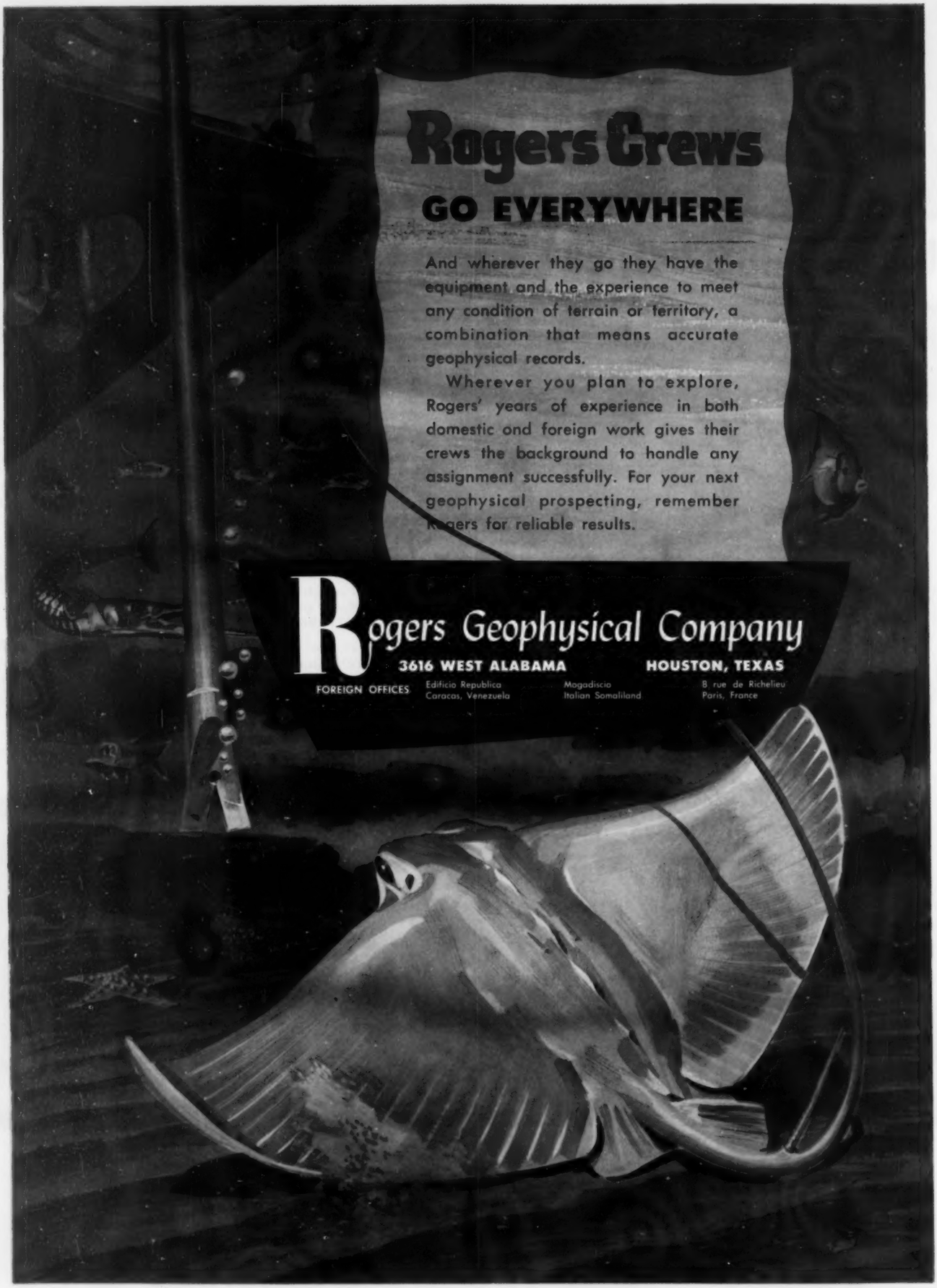
SUBSIDIARY OF SEISMOGRAPH SERVICE CORPORATION, TULSA, OKLAHOMA, U. S. A.


Rogers Crews
GO EVERYWHERE
And wherever they go they have the equipment and the experience to meet any condition of terrain or territory, a combination that means accurate geophysical records.
Wherever you plan to explore, Rogers' years of experience in both domestic ond foreign work gives their crews the background to handle any assignment successfully. For your next geophysical prospecting, remember Rogers for reliable results.
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DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

September ★ *One of a Series of Interest to the Petroleum Industry* ★ *1954*

This new booklet helps dealers answer customer complaints on poor power

How do your dealers react when a customer complains that the gasoline they sell lacks power? Do they lose the customer? Or are they able to counter with some ready and convincing sales ammunition?

If they have trouble answering these complaints in a way that keeps the customer coming back, the four-page folder shown above can be a big help to them. It describes the many mechanical troubles that can cause power loss . . . such as poor spark plug condition, improper distributor or carburetor settings, leaky intake manifold and the various factors contributing to low compression. And it discusses them in a simple, easy-to-understand style.

Ask any Du Pont Petroleum Chemicals Division representative for a sample copy, and for information on obtaining them in quantities for your dealers.

New Silica Grease Thickener Announced

Here is a *new type* of grease thickener!

This new additive, Estersil GT, is quite different from any thickener

IN THIS PILOT PLANT at the Du Pont Petroleum Laboratory, we will be glad to help you formulate improved greases with Estersil GT and your own oil stocks.

previously used in commercial grease production. It is made by Du Pont and sold exclusively by the Du Pont Petroleum Chemicals Division.

Chemical "Raincoat"

The new material, an estersil, is a pelletized form of finely divided amorphous silica. One of its outstanding properties is a water repellent "raincoat" which is chemically attached to each tiny particle.

This chemically bonded "raincoat" means that you can now make a grease with unusual resistance to washout or breakdown in the presence of water.

Synthetically Made

Estersil GT is completely synthetic. And it was specially developed by Du Pont for grease compounding. With it, you can easily prepare a unique *multi-purpose* grease that will give remarkable endurance on even the most gruelling assignments.

In addition to water resistance, your greases made with Estersil GT will show unusually high thermal stability, superior oxidation stability, and exceptional shear stability under both normal and high temperature conditions. They possess superior handling qualities, too.

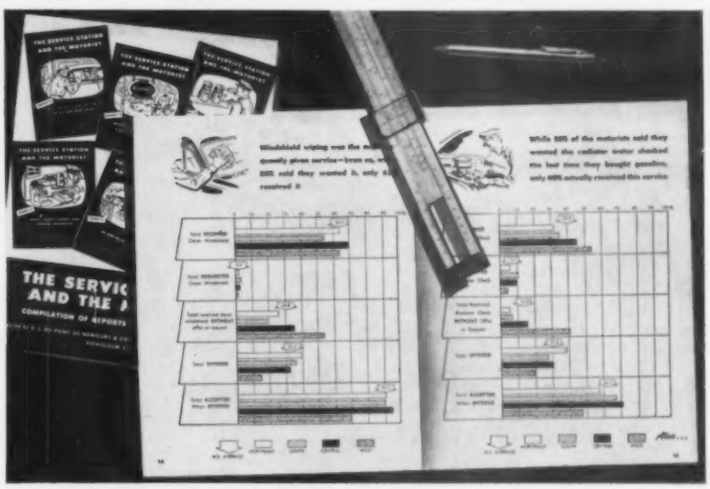
For more information and free samples of Estersil GT, address your request to our Wilmington office.

YOUR CUSTOMERS TOLD US!...

And we have now published their preferences in a single volume to help you evaluate services and promotions.

During the past year and a half we have published six different reports on the extensive Du Pont survey of service station customer buying habits and preferences. But the demand for these individual reports has far exceeded the supply.

Now, to help catch up with the demand and to provide marketing men with the over-all story in one handy reference book, we have combined all the reports into a single volume for selective distribution.



YOUR CUSTOMERS ARE AN "OPEN BOOK" when you keep handy a copy of this Du Pont survey report, "The Service Station and the Motorist."

The new book covers many different aspects of oil company marketing and customer purchasing habits. And it is arranged in chapters according to the following breakdown:

1. Selection of the service station and customer loyalty to the station.
2. Brand name recognition

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Survey Report*

and loyalty to brand.

3. Knowledge of gasoline grades and reasons for purchase.
4. Price, credit cards and charge accounts.
5. Oil and TBA purchases.
6. Services wanted by the motorist, asked for by the motorist, and given by the dealer.

By providing you with an accurate reading of customer preferences, this new book can help you tailor promotions for maximum effectiveness and efficiency.

How It Was Done

The survey is the result of thousands of household interviews with service station customers . . . and many more thousands of actual observations at the pump island where purchases are made. The interviews show what customers *think* and *say* about your products and dealer services. The observations, taken at 1,193 different service stations, show what customers *actually do* when making a purchase. The survey itself, which was conducted by National Analysts, Inc., is completely impartial.

Regional and Seasonal Breakdowns

National in scope, the survey is so organized that the findings can be analyzed according to region—for the four main marketing areas of the country. Separate breakdowns by sex, income and age of the respondents are also included, as well as breakdowns for age and price of car.

What's more, the service station observations are catalogued according to seasons – and based on about 6,000 observations during each of the four seasons.

In addition to the one-volume report, the complete information collected by this survey is recorded on IBM cards. Thus, it can be cross-tabulated to provide a wide variety of specialized breakdowns.

As such, we believe this Du Pont survey of consumer gasoline and TBA buying habits to be the most comprehensive, penetrating and accurate ever undertaken by any segment of the petroleum industry.

Special Distribution

Although the new one-volume report on this survey is not available to marketers all the way down the line, it will be distributed on request to marketing executives. And it is ideal . . . as reference material . . . for use by oil companies in preparing condensed marketing information for general dealer distribution.

SEATTLE DISTRICT MANAGER

ROBERT E. HOLETON is the district manager in charge of sales for the Du Pont Petroleum Chemicals Division in Washington, Oregon, and Idaho. His headquarters are in Seattle.

He joined the Du Pont Company as a chemist in 1933. After a wide experience in a number of Du Pont laboratories and semi-works areas, Mr. Holeton was transferred to the Petroleum Chemicals Division in 1949.

Prior to his present assignment in the newly created Seattle District, he was a sales-service representative in the Division's Eastern Region.

He is a graduate of Temple University and a member of the American Chemical Society.

ROBERT E. HOLETON

New Way to Protect Blending Plant Scales and Weightographs

A lightweight polyethylene cover is now available to you on request for protecting blending plant scales and weightographs during washdowns.

The new scale cover was specially designed for this purpose by Du Pont. It fits neatly and can be removed quickly.

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The new scale covers have already been installed in many plants. Refiners using them report excellent results in helping prevent rust which may be caused by excessive moisture accumulation during blending plant washdowns. The scale covers also provide protection against corrosive action when equipment is not in use. And they have greatly improved housekeeping efficiency in blending plants where former makeshift covering required special handling.

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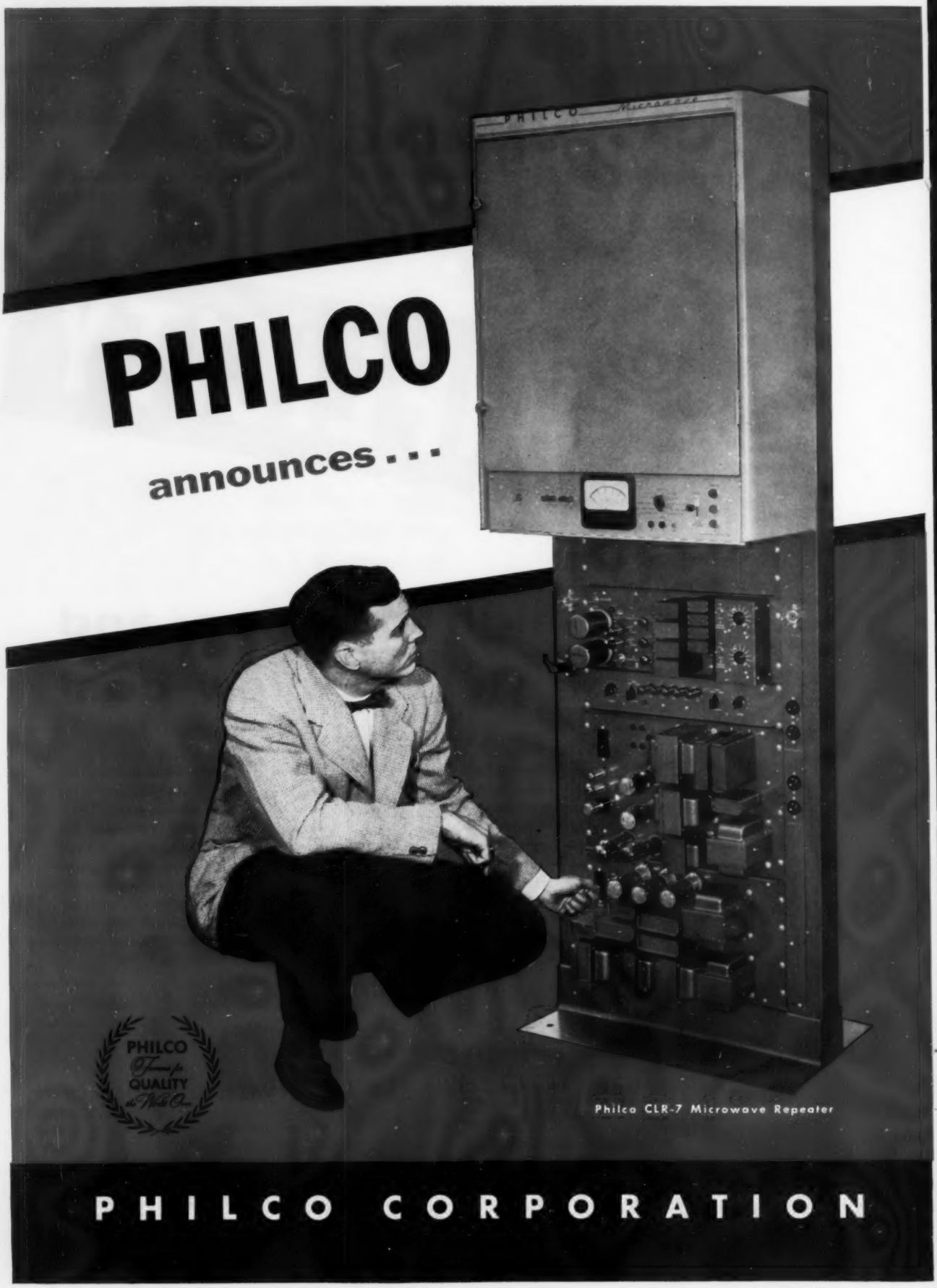
announces . . .



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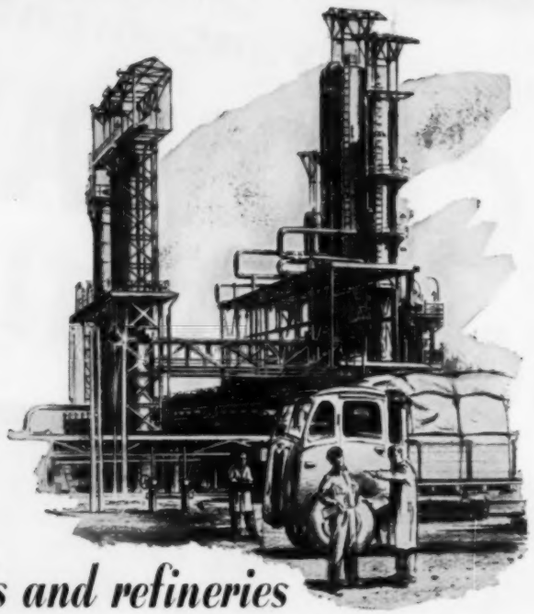

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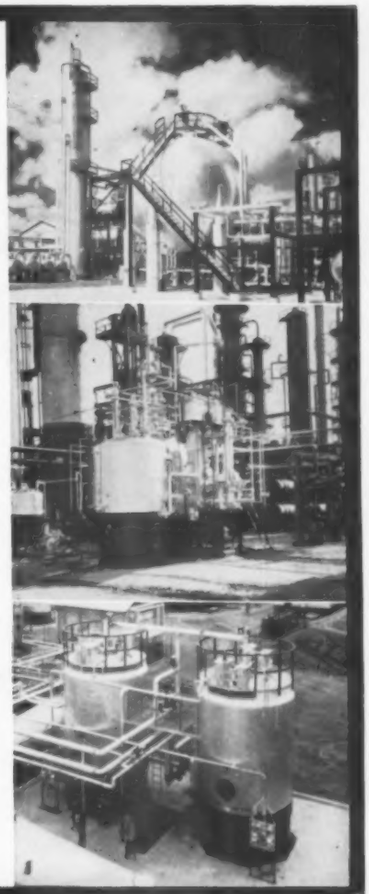

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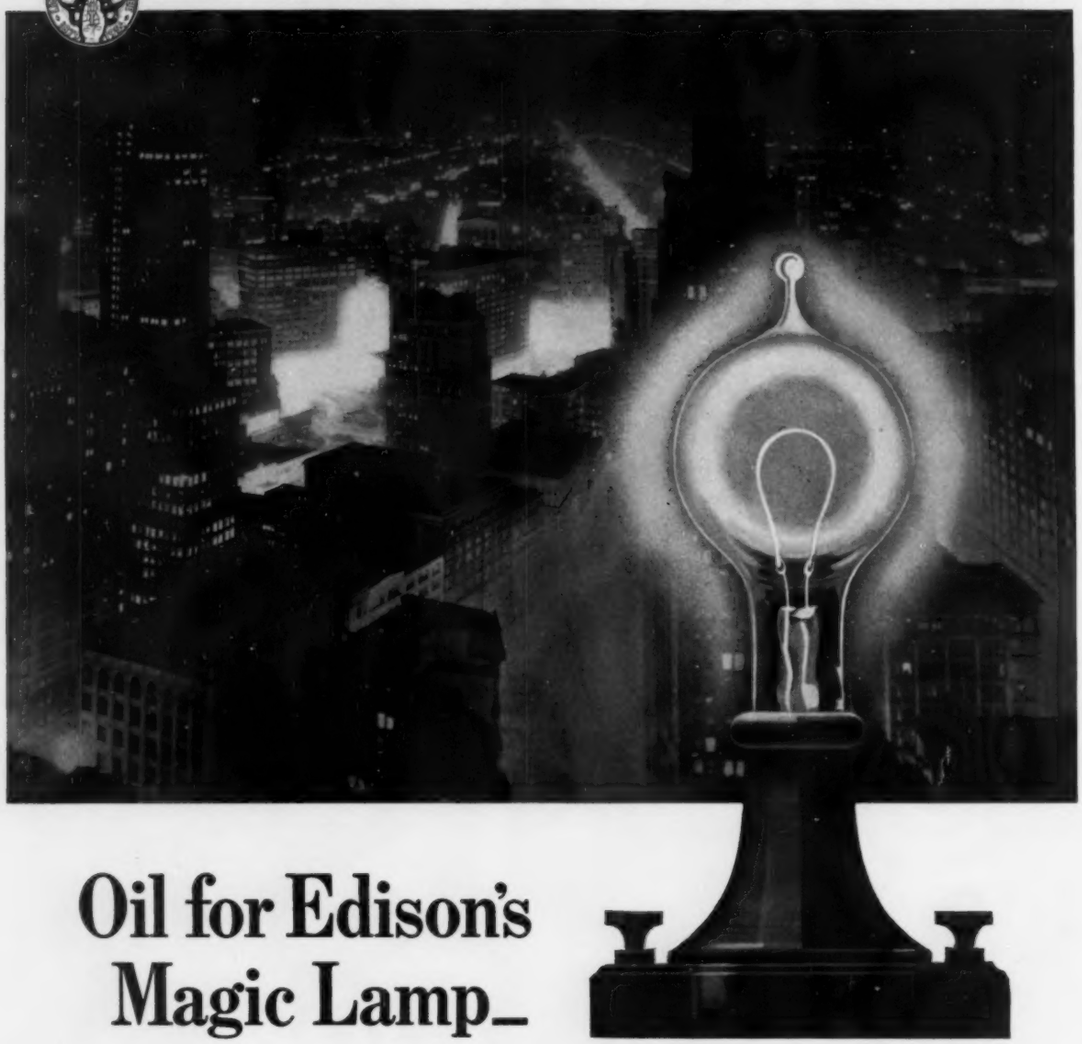

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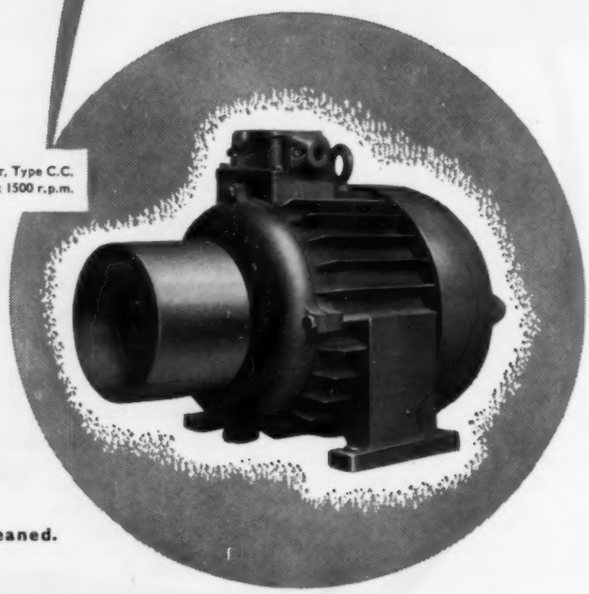

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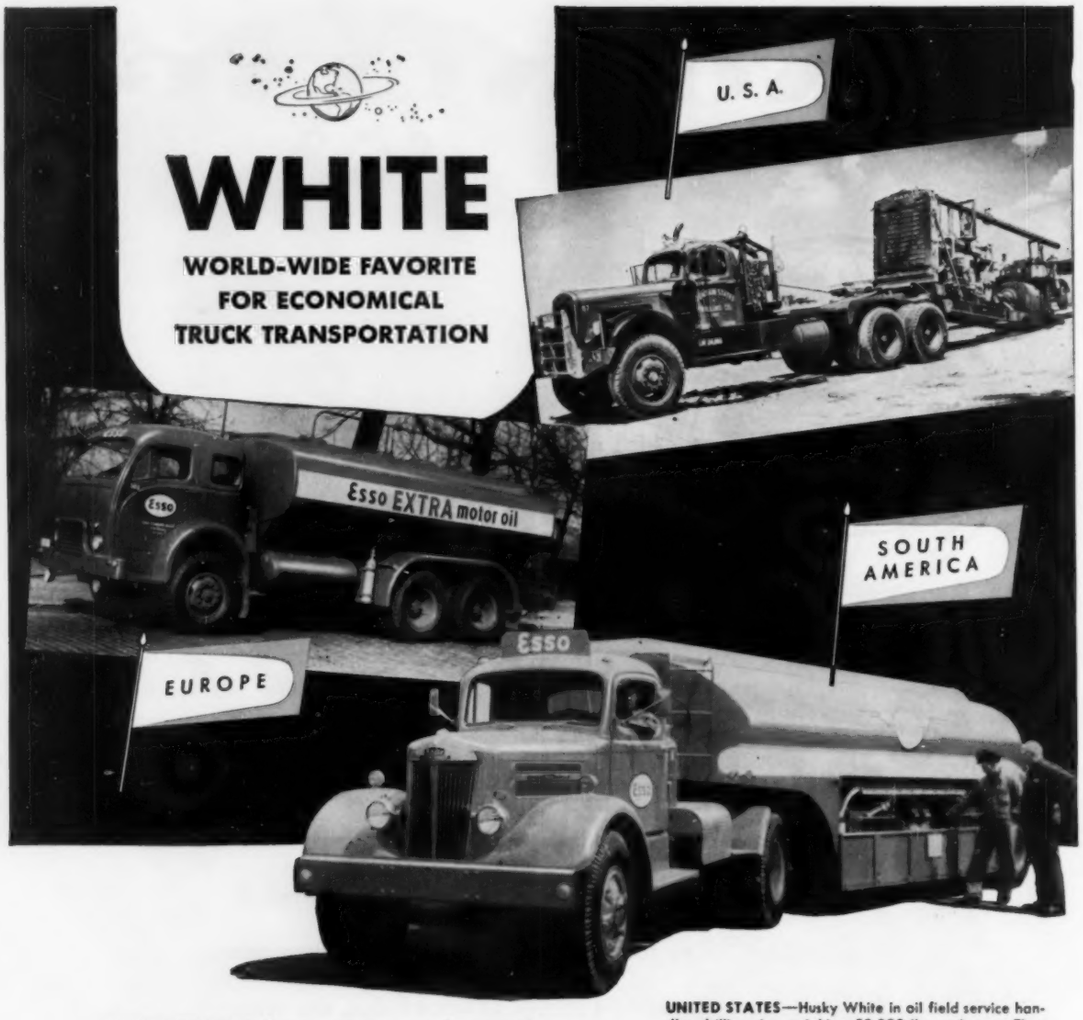

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Are you getting maximum high temperature tube life per dollar? *Ask the experts!*

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SEVERAL of the high temperature steels listed below are probably adaptable to your particular conditions of heat, pressure, oxidation and corrosion. But, only *one* will give you maximum tube life per dollar, the best life/cost ratio.

To find that one, ask the experts!

Who are the experts? Metallurgists of The Timken Roller Bearing Company. They're recognized authorities on high temperature steels. Backed by over 20 years of experience, they'll help you choose the one best steel for your application from the 23 different analyses at their disposal.

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Ask the experts! The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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Suggested as a substitute for 0.50% Mo. steel. Has greater creep strength and somewhat better corrosion and oxidation resistance than 0.50% Mo. steel. For use in cracking furnace tubes, high pressure boiler tubing, superheater tubing and high temperature steam piping.

23 TIMKEN STEELS FOR HIGH TEMPERATURE SERVICE

Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2¼	Sicromo 5MS	25-20
DM-2	2¼% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	25-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

*Not available as seamless tubing at the present time.

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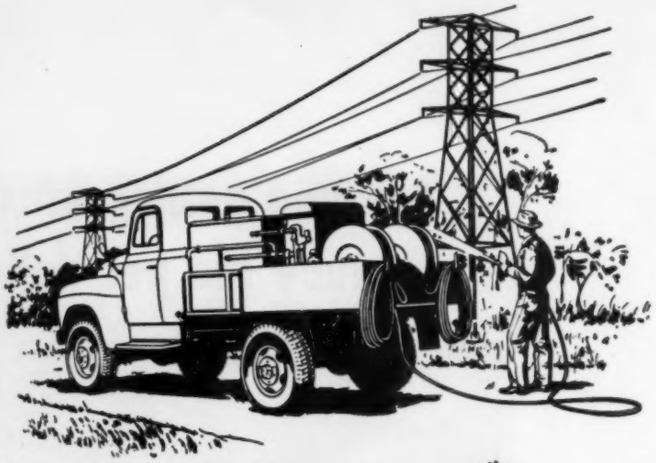

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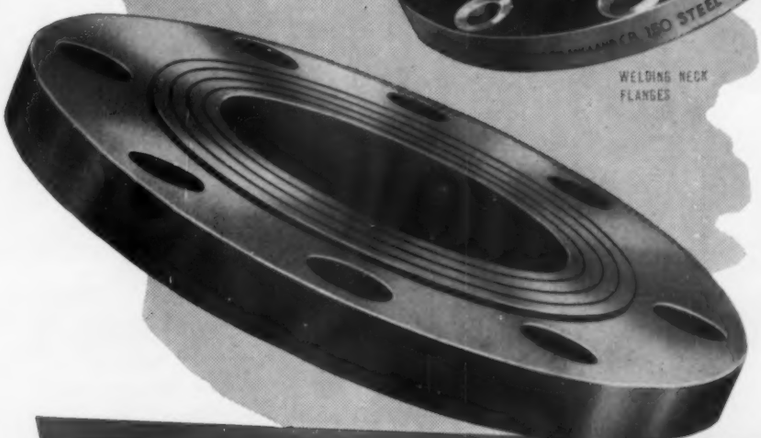

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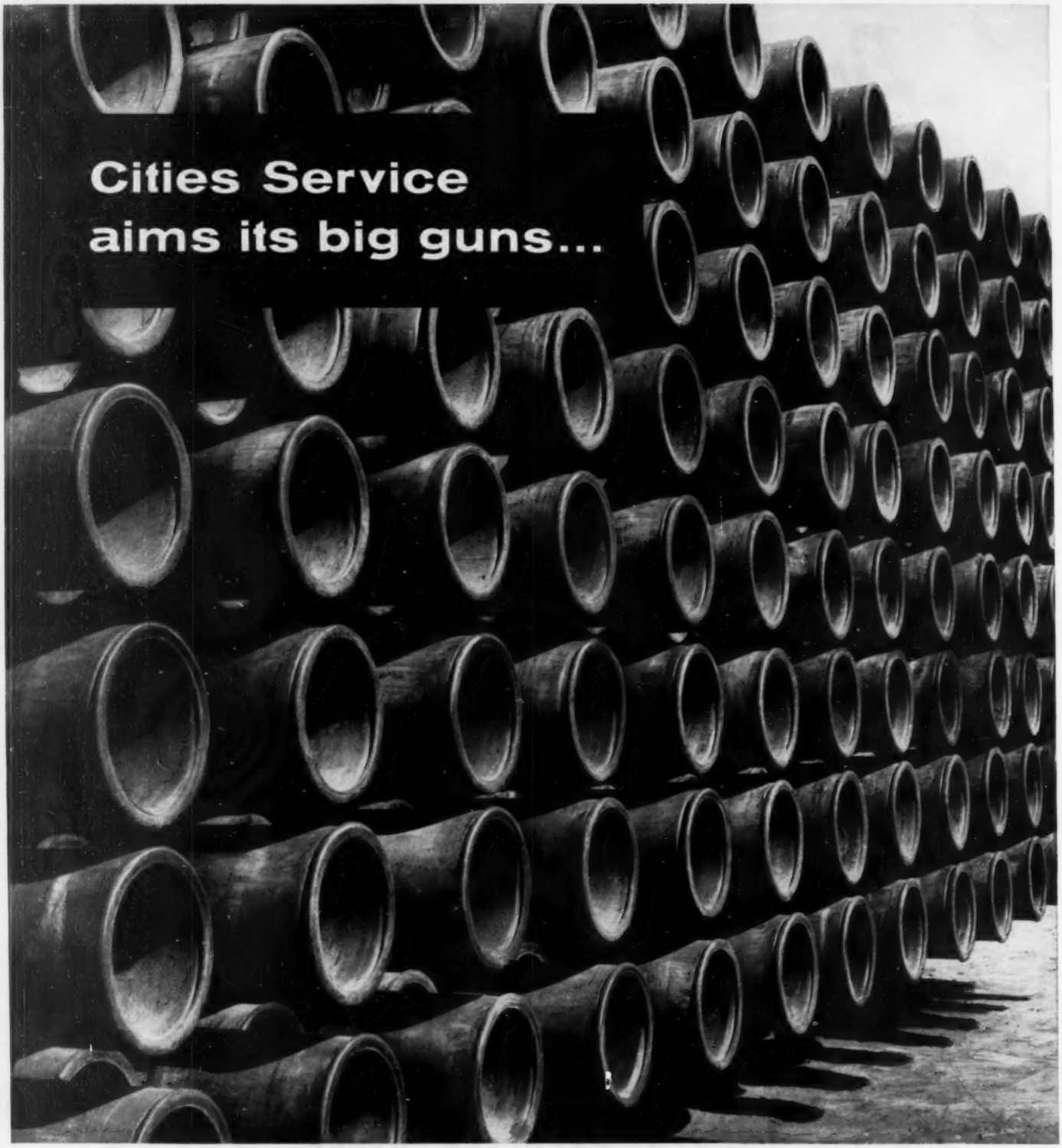

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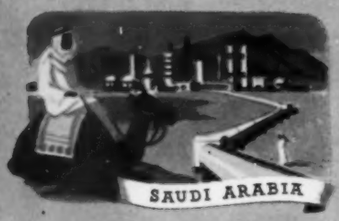

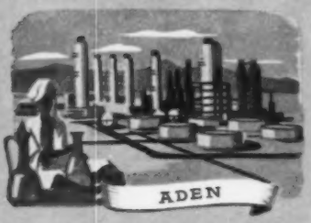

In Many Lands

Technical knowledge and organization are assisting many countries in the development of their resources. Bechtel is performing a basic function in this program of international cooperation . . . as an engineer and constructor of projects in many world areas.

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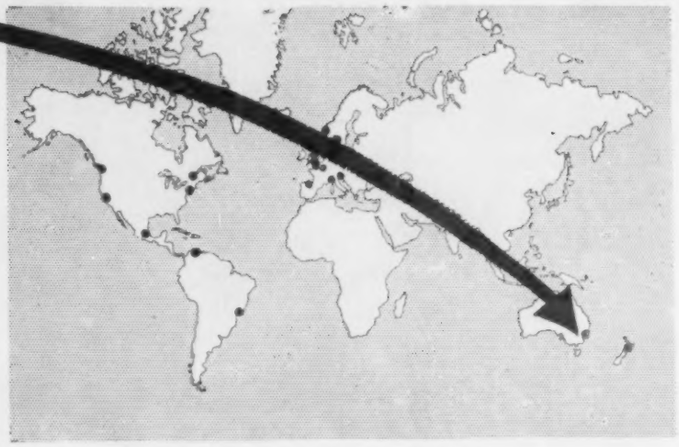
in Australia



At Sydney an associated "International" factory is making paints for a great variety of purposes. Their intimate understanding of paints suitable for the Australian market contributes in no small measure to the wealth of knowledge accumulated by "International's" world-wide organisation.

"International" have associated Companies in 15 other countries and close co-operation ensures the ability to supply the right paint for anything, anywhere. "International" products for the oil industry include METAL PRIMERS and ALUMINIUM PAINT for storage tanks; DRUM PAINTS, and ENAMELS for general purposes.

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of oil are used in the world every year – a figure that must be seen to be believed. Imagine a pipe line filled with oil 48 inches in diameter circling the earth 16 times, or in other words 1,150,000 miles long. Our whole mode of life and the very maintenance of modern civilization depend on that amount of oil per year. To obtain it is a tremendous and continuous struggle as consumption continuously increases. Mannesmann shares in the battle for oil. Only the seamless steel tube made it possible at all to drill thousands of feet for liquid gold. Mannesmann casing and tubing strings bring up oil today all over the world, and Mannesmann steel pipe lines carry it to its destination. To the refineries which resemble a spider web of tubes, we supply pipe, valves, and fittings. The universal confidence in Mannesmann products for the petroleum industry is based on experience in oil fields all over the world.

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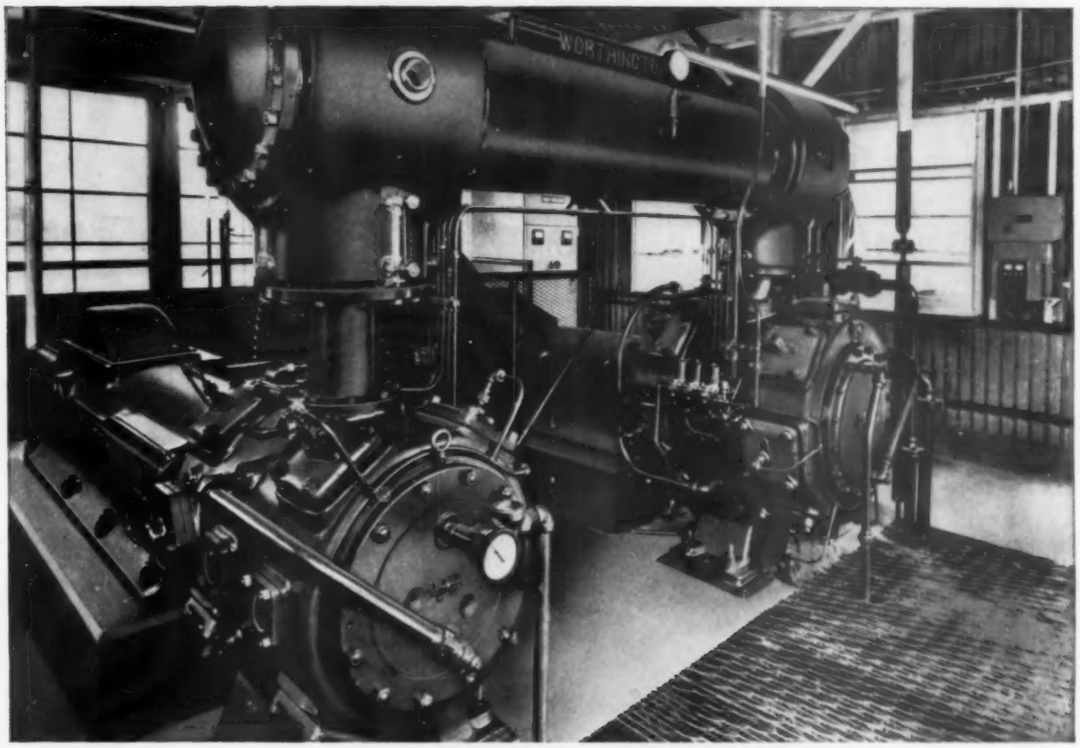

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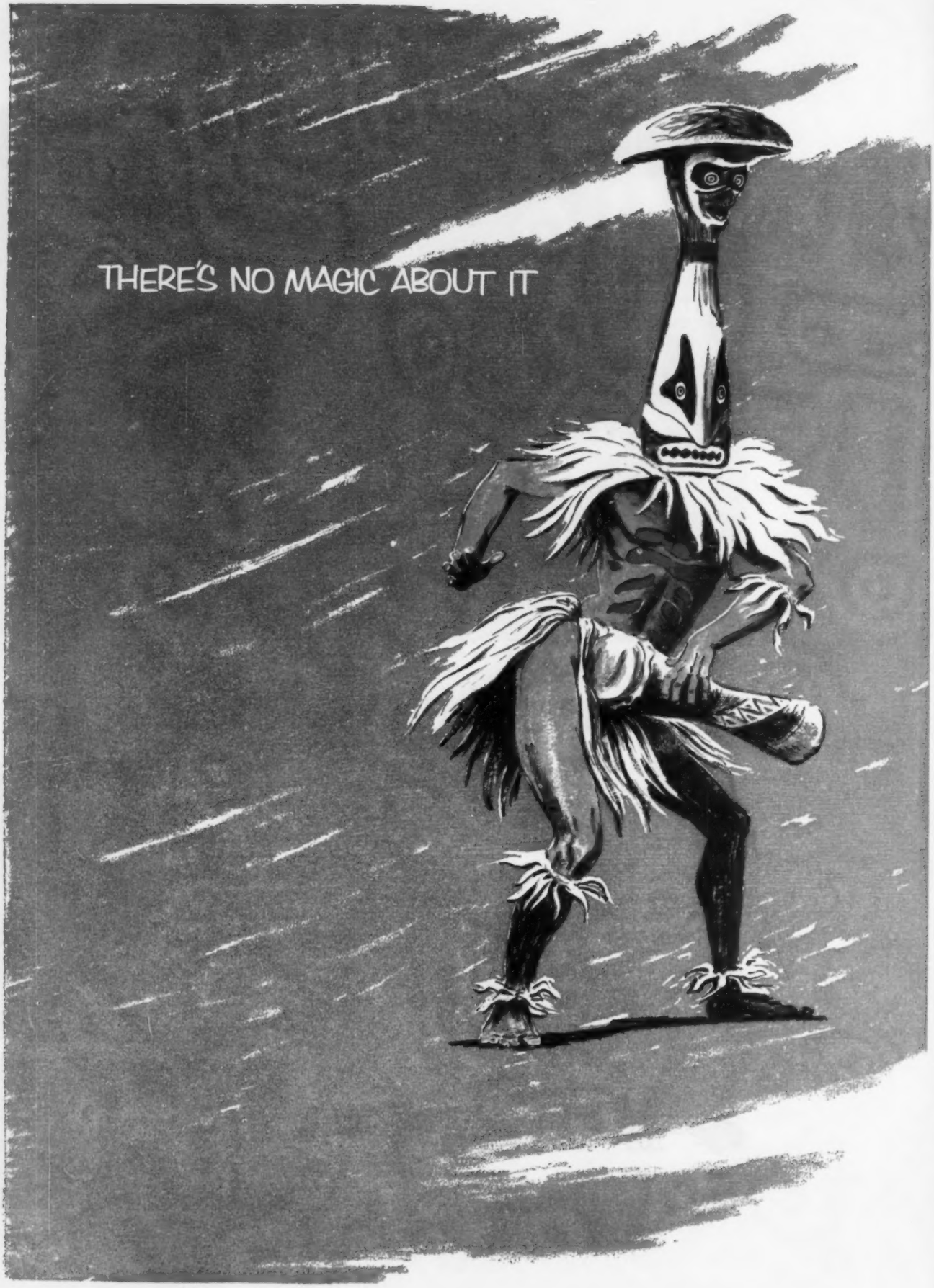
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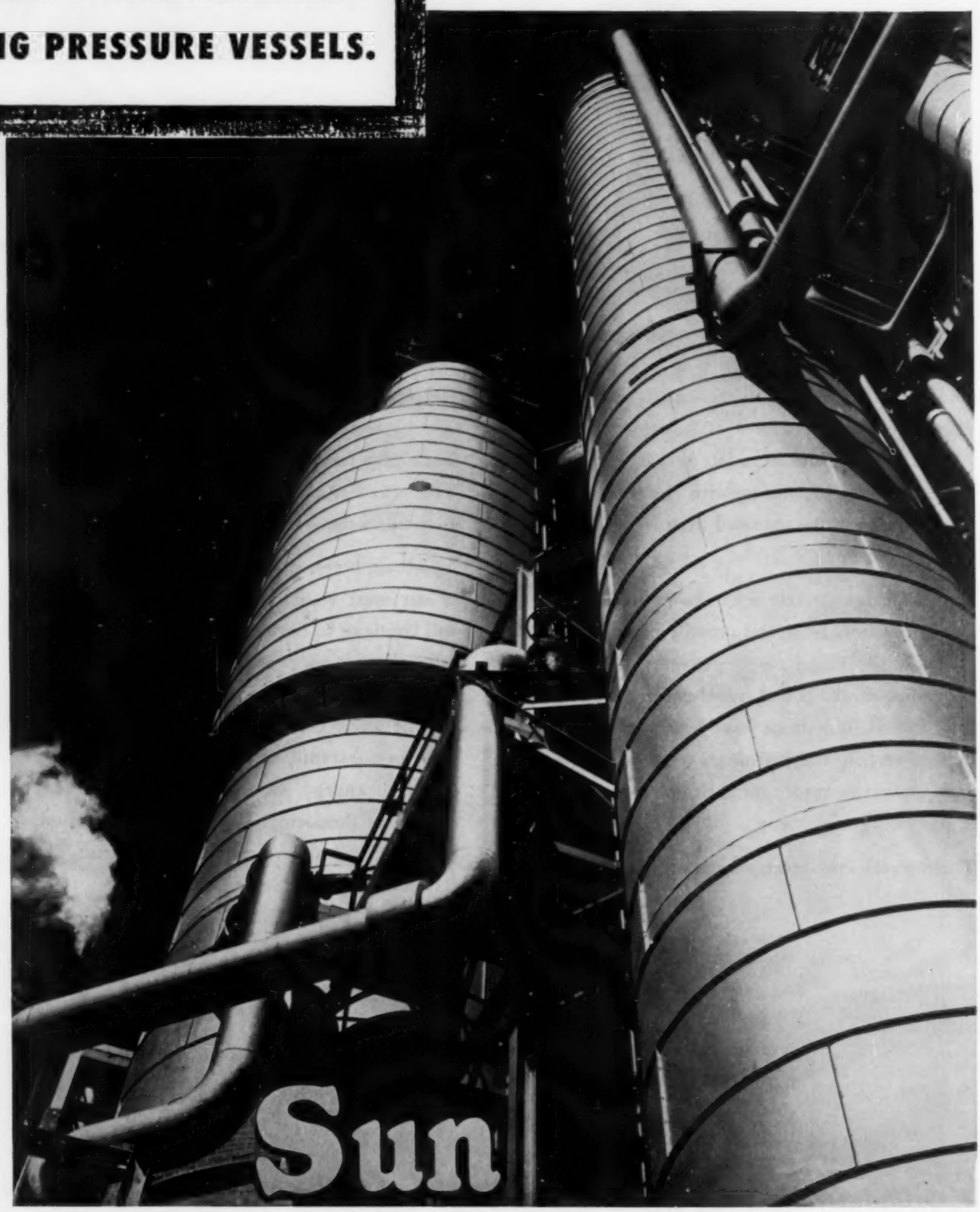

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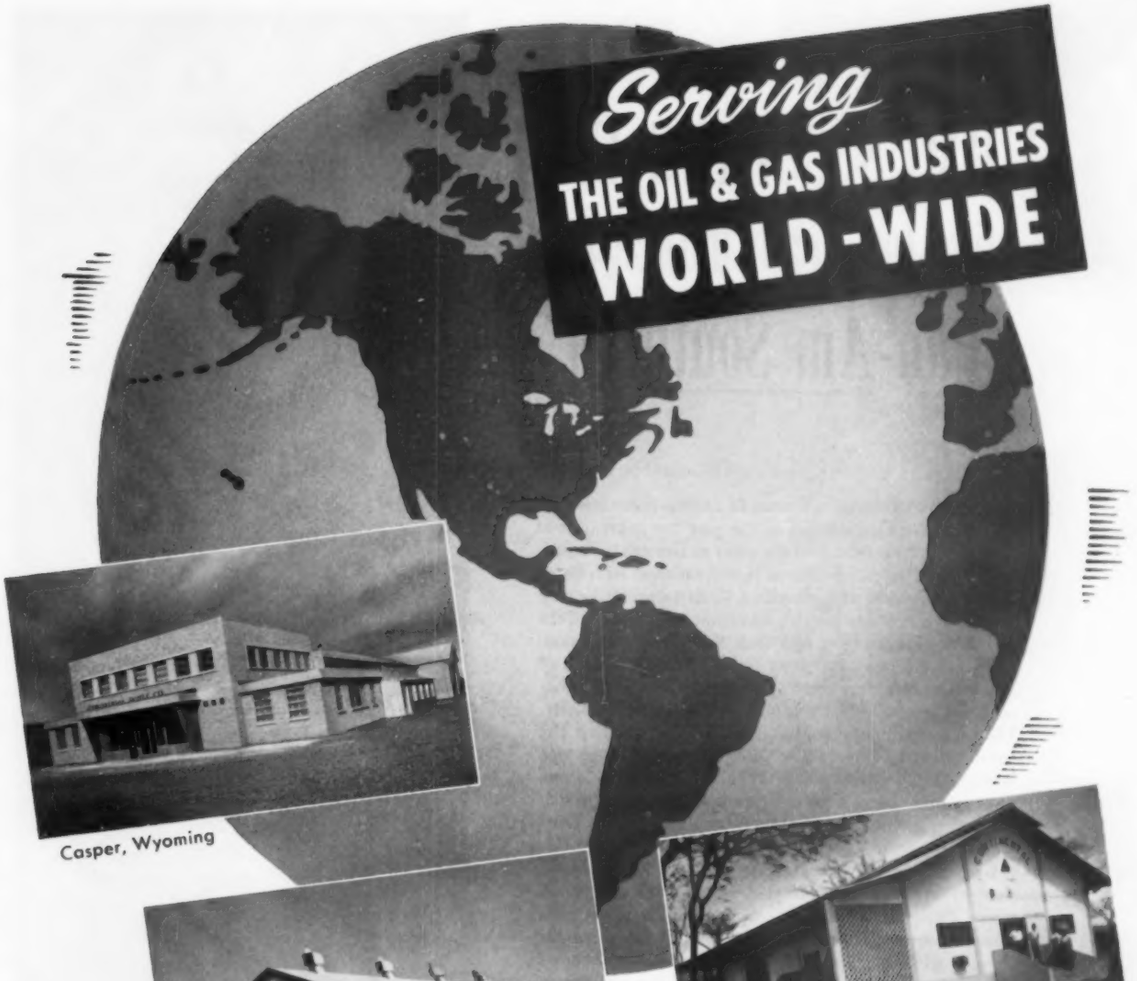

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VOL. 25, NO. 10, SEPTEMBER, 1954

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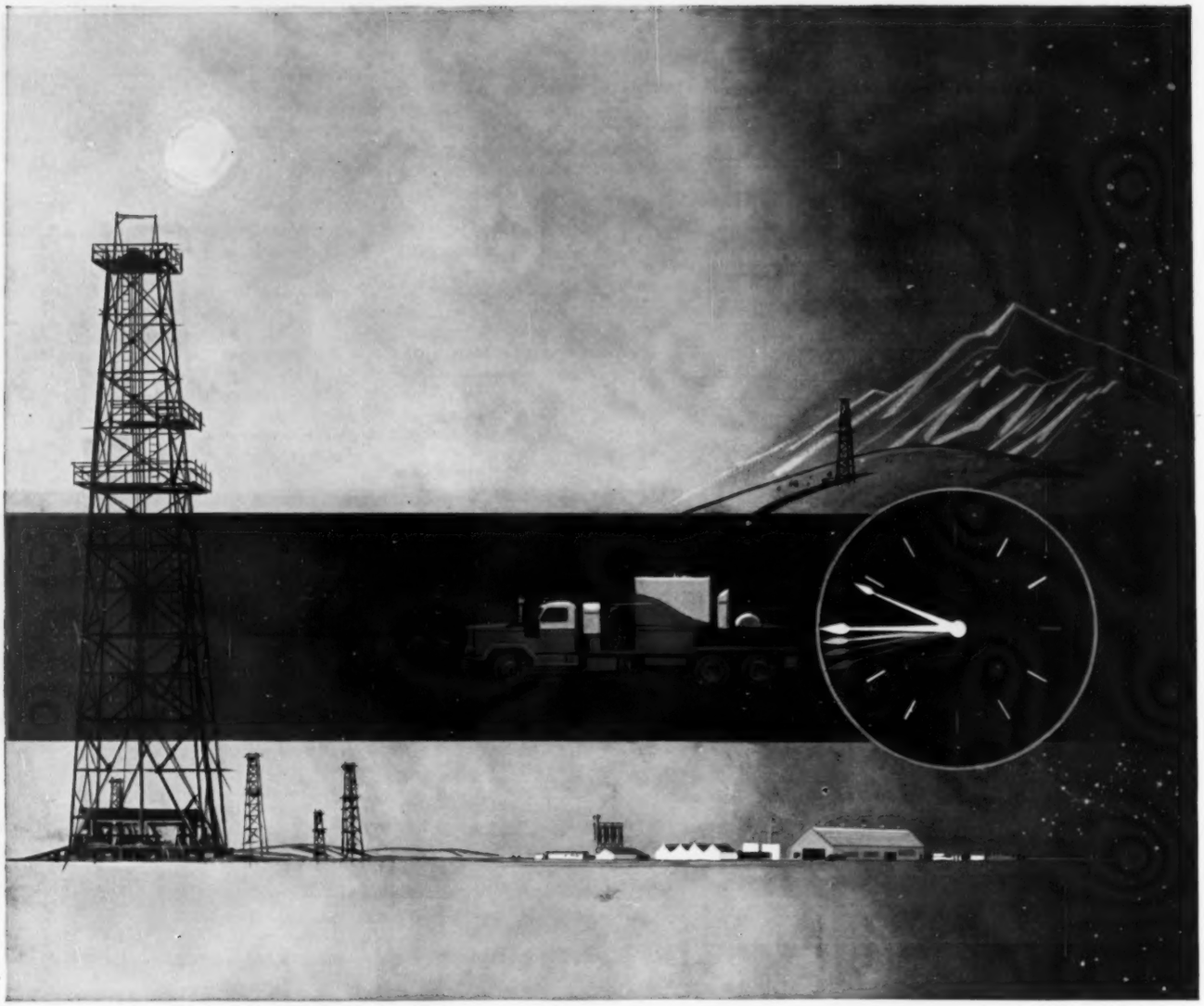
CONTENTS

49 Agreement Opens Way to Iran Recovery
50 Agreement Reached on Iran Oil Operation
52 Abadan—Problem for the Consortium
53 Iran
58 Kuwait—Small in Area but Rich in Oil Reserves
64 Iraq Petroleum Company Holds Central Position in Middle East
70 Saudi Arabia—Oil Empire of the East
73 World Petroleum Map of Middle Eastern Oil Fields
80 World Oil Consumption up 5.5 Percent
82 Jatibonico Find Stimulates New Exploration Activity in Cuba, by Ruth Sheldon Knowles
86 Neftyanye Kamny—City of Oil Rocks
88 Colombia Offers Outstanding Oil Prospects, by E. Ospina Racines
93 Bahrain Petroleum Co. Ltd.
94 Search for Petroleum Production Extends Throughout French Union, by J. Ed. Pellissier
100 Parentis Discovery Held Significant
102 South America Increases Production and Expands Exploration, by Dr. Juan E. Rassmuss
106 Canada: Canadian Production Rises 25 Percent in 1954 Half Year, by J. L. Irwin
108 British Oil News, by E. Lawson Lomax
113 Washington Pipe Line: Congress and the Petroleum Industry, by Joseph Huttlinger
116 Review of Recent U. S. Patents on Petrochemicals, by Heinz Heinemann and Felix Heinemann
124 International News & Notes
132 Oil Company Staff Changes
162 Advertisers' Index

THIS MONTH'S COVER

Catalytic cracking unit at the refinery on Bahrain Island of Bahrain Petroleum Co. Ltd., one of the Caltex group of companies. Large valve in the foreground is in the salt water line supplying cooling water to the refinery. Color plates are reproduced through the courtesy of Bahrain Petroleum Co. Ltd.



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PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

Agreement opens way to Iran recovery

AN EVENT THAT IS EASILY the most outstanding of the year in the chronicles of petroleum was the signing on August 5 of an agreement designed to restore the flow of Iranian oil to the world's markets. The occurrence had interest extending much beyond that industry, however. It had implications of great political significance in the mercurial climate of the Middle East and in the competition between the aggressive Communist bloc and the free world. It removes the immediate threat of Iran's envelopment behind the Iron Curtain and should encourage greater independence among nations of the eastern world in resisting subversive infiltration.

For the people and government of Iran the conclusion of the agreement signalizes the end of an economic nightmare which has lasted for the past three years. Precipitated under the insane leadership of an irresponsible zealot, the violation of the contract between the government and the Anglo-Iranian Oil Company brought the thriving Iranian oil industry to a complete standstill and plunged the nation into a morass of debt and a state of progressive economic deterioration.

Analysis of the agreement concluded last month shows that in effect it affords Iran the good fortune of having its oil production resumed on practically the same terms offered it before the break in 1951. Despite all the discussion about nationalization, there never was any question of the ownership by Iran of its mineral resources. The contract with Anglo-Iranian simply provided for the production of crude oil, its conversion into usable products and their distribution over a specified period. The life of the present agreement with its optional extensions parallels almost exactly that of the one previously in effect and the terms governing the division of income between the two parties, though perhaps more clearly defined, are in substance virtually those which the former tenant had offered and are identical with those governing operations in other countries in that part of the world.

On the debit side, so far as Iran is concerned, is the loss of hundreds of millions of dollars of revenue during the three year period of stagnation, the economic disruption and the heavy burden of debt that still hangs over the country. Beyond that is the fact that the industry must start anew from scratch and that some time must elapse before production can approach its former volume.

Fears that settlement of the prolonged *impasse* might encourage other governments to follow Iran's example would seem to be groundless in view of the history of the past three years. On the contrary, the object lesson afforded by that experience should be a deterrent to ambitious dictators who might be tempted to follow the mad example of Dr. Mossadegh and his associates.

Apprehension within the ranks of the oil industry lest the return of Iran to activity at a time when the world is well supplied with oil from other sources should be allayed by the form and terms of the agreement now arrived at. In the announcement given out at the time of signing it was stated that, after the three year period of limited production, it would be the policy of the operating companies to continue "taking quantities of crude that would reasonably reflect the supply and demand trend for Middle East oil." That, as nearly as can be stated in simple terms, is a declaration against ruthless and destructive competition and in support of orderly procedure and trade stability.

The negotiation thus concluded is an example of economic statesmanship on the part of the officers and directors of the oil companies concerned. None of them needs the oil that Iran can supply, but they waived selfish considerations in order that the Iranian industry might be restored to operation on a basis contributing to the welfare and progress of the Iranian people and the maintenance of their country as an independent and equal member of the galaxy of nations.

Success could not have crowned the work of the individual negotiators without the consistent backing of their own governments and the advice and assistance of diplomatic representatives on the spot. Nor could any sound settlement have been reached or even attempted without the intelligent and constructive attitude of Premier Zahedi and his associates and their co-operation in working out a fair and equitable solution.

Agreement reached on Iran oil operation

IN SUBURBAN SHIMRUN, outside Teheran, on August 5, was signed an agreement between the government of Iran and the representatives of a group of international oil companies that are undertaking restoration of Iranian oil production. Thus opened a new chapter in the sometimes stormy history of Persian oil. Signatories to the agreement were Dr. Ali Amini, finance minister of Iran, and Howard W. Page, vice president of Standard Oil Company (N.J.) and chairman of the committee representing the group of contracting companies.

By the terms of this historic document, two operating companies are to be incorporated in the Netherlands to operate the oil fields and the refinery at Abadan. Each company will have seven directors, two to be named by Iran and five by the companies forming the consortium. These two companies are to have direct charge of oil production and refining, acting under powers and authorization conveyed from the government through the National Iranian Oil Company.

The operating companies will purchase oil from the Iranian company, paying at current rates for oil exported, and will have charge of the transport and sale of such crude and products. At option the National Iranian Oil Company may take oil in lieu of payments up to 12.5 percent of total exports. Products for consumption within Iran will be made available substantially at cost.

The National Iranian Oil Company will handle the distribution of oil products within the country and will retain and operate the small Naft-i-Shah oilfield and the Kermanshah refinery to supply part of domestic needs.

Through the royalty provision and application of Iranian tax laws it is anticipated that the division of income between the government and the operating companies will be approximately on a 50-50 basis such as applies in other petroleum producing countries in the Middle East.

According to the joint statement issued at the conclusion of negotiations, expansion of operations, following a starting-up period of three months, will provide exports of crude and products to a minimum of 80,000,000 cubic meters (a little over 500 million barrels) during the first three years in addition to 5,000,000 cubic meters (31 million barrels) for internal consumption. Income to Iran is estimated at £150 million ($420 million) beginning at £31 million ($86.8 million) for the first full year of operation and rising to £67 millions ($167.8 million) in the third year.

After the third year the companies are to continue taking crude in quantities reasonably reflecting the supply and demand trend for Middle East oil, assuming favorable operating and economic conditions in Iran.

The agreement is to continue for 25 years with the option of renewals for three five-year periods, bringing its possible total up to 40 years, a potential span of life approximately equal to that of the concession previously held by Anglo-Iranian Oil Company.

In addition to the two operating companies which will have their headquarters in Iran, the consortium plans to establish a company in London to look after the affairs of the group.

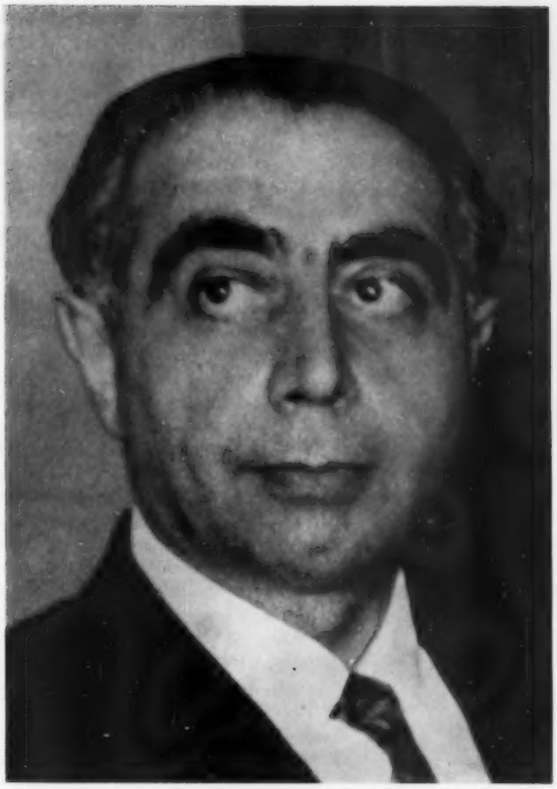
Each of the companies participating in the operating plan will purchase its share of oil individually through its own trading company established in Iran and will dispose of it through its own channels at its posted export price fob Iranian ports, thus preserving the competitive relationship of the various participants. The two operating companies to be organized will not buy, sell or own the oil. They will act as service organizations, receiving a fee for their work in producing and refining.

At the same time with the conclusion of the operating agreement, a separate agreement was signed by Finance Minister Amini for the government of Iran, British Ambassador Sir Roger B. Stevens, and H. E. Snow, a managing director of Anglo-Iranian Oil Co., fixing the compensation to be paid to the company for surrender of its claims at £25 million ($70 million) to be paid over a period of ten years. This is far below the amount originally demanded by Anglo-Iranian, but that company will receive additional sums from other members of the consortium for "quit claims" issued to them by the former concession holder.

The agreement brings to a close a hiatus of three years in Iranian petroleum operations, dating from the passage of the law nationalizing the industry on April 30, 1951, and the subsequent expulsion of the British. This action precipitated a political and financial crisis, plunged Iran into a morass of debt, and caused Iranian oil to disappear from the world's markets and to be supplanted by increased production in other exporting countries.

The consortium which now prepares to take over the operation of the Iranian oil industry is composed of eight international companies with participation as follows: Anglo-Iranian, 40 percent; Royal Dutch/Shell group, 14 percent; Compagnie Francaise des Petroles, six percent; and the remaining 40 percent divided equally among the five American members, Standard Oil Co. (N.J.), Socony-Vacuum Oil Co., Standard Oil Co. of California, Gulf Oil Corp. and The Texas Co.

Negotiations leading to the organization of the consortium and the terms on which it would be willing to undertake the task of restoring the Iranian oil industry to operation have been proceed-



Ali Amini, Finance Minister of Iran.

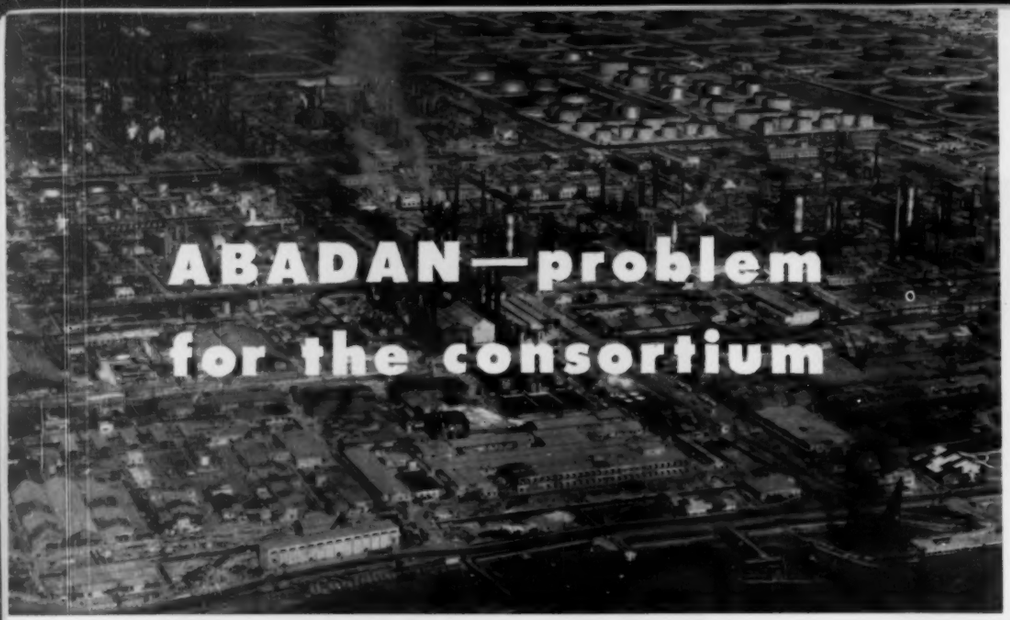
Howard W. Page, vice president of Standard Oil Co. (N.J.).

Herbert Hoover, Jr., special assistant to the U. S. Secretary of State, who now has been appointed Assistant Secretary of State.

ing over the past several months among executives of the companies involved. At the same time representatives of the companies carried on discussions with officials in Teheran to work out a mutually acceptable agreement. Because of the international factors involved, officials of the British foreign office and of the State Department of the United States and diplomatic representatives in Iran took part in the negotiations as well as a number of independent oil experts. Herbert Hoover, Jr., special assistant to Secretary of State John Foster Dulles, has spent practically all his time for many months past shuttling back and forth between London, Washington and Teheran while United States Ambassador Loy Henderson, stationed in Teheran, did much to smooth the way of the negotiators.

In the joint statement issued in Teheran on August 5, it was pointed out that to make the agreement legally effective, it had still to be approved by the boards of directors of the participating companies, to be enacted into law in Iran and to receive the approval of the Shah. Confidence was expressed, however, that these acceptances would be forthcoming.

Loy Henderson, U. S. ambassador to Iran.



ABADAN—problem for the consortium

RETURN OF IRANIAN OIL to Eastern Hemisphere markets will present a refining as well as a crude disposal problem to major marketers who make up the consortium. Facts are that neither the crude from Persian fields nor the refinery still capacity at Abadan are required today, nor will they be required within the next three years in which the consortium has agreed to fit the oil into their operations.

When the government of Iran seized the Anglo-Iranian properties, the loss of 500,000 b/d of refining capacity and 700,000 b/d of crude presented an immediate and pressing problem. Even at that time, the problem was not so much that of oil supply as of transportation. There was enough oil available, but it was in the wrong place and there was no surplus of tankers.

The failure of attempted negotiations with Iran finally caused refiners to build new capacity in the Middle East itself and in Africa, Asia and Oceania to replace the Abadan refinery. Much of this capacity already is on stream and a great deal more will be ready next year.

Middle East capacity outside of Iran in 1951 totaled 423,500 b/d. In Africa, Asia and Oceania an additional 355,900 b/d of capacity was available. Consuming demand in the area was about 1,220,000 b/d, leaving a shortage of 441,000 b/d. Even before the Abadan shut-down, the Middle and Far East thus was importing substantial volumes of refined products from Europe, the United States and the Caribbean.

Three years later, Middle East still capacity outside of Iran totals 639,000 b/d, an increase of 216,000 b/d, or roughly 50 percent. In Asia, Africa and Oceania, capacity today is 565,780 b/d. This is an increase of 209,800 b/d, or nearly 59 percent over 1951. Total capacity east of Suez is 1,204,000 b/d without Abadan.

Next year an additional 218,000 b/d of new capacity will be ready to operate in Asia and Oceania, raising capacity of region to 1,422,000 b/d without Abadan.

Consumption east of Suez this year will approximate 1,500,000 b/d. At the current rate of growth, 1955 demand will be about 1,635,000 b/d. Dependence on Europe and the Western Hemisphere will be about 135,000 b/d, compared with 441,000 b/d after Abadan was shut down.

Outstanding among the projects completed in the past three years has been the new 120,000 b/d refinery built at the mouth of the Red Sea at Aden by Anglo-Iranian Oil Co. Ltd. This plant, which went on stream a month ago, is strategically located for bunkering and dispatch of refined products either east or west as markets may dictate. South Africa also has a new 15,600 b/d refinery built by Standard-Vacuum to serve growing markets there. Australia has embarked on a building program which already has almost tripled still capacity. Japanese capacity today is double what it was three years ago.

India will become an important oil refining nation in 1955 with three new plants. Burmah-Shell is spending $47 million at Bombay to build a 40,000 b/d refinery. Near the same city Standard-Vacuum is building a 25,000 b/d plant. Caltex will build a 10,000-barrel plant.

Although Australian capacity has risen from 20,000 to 59,700 b/d in three years, the end is not in sight. Three additional plants will add another 100,000 b/d of still capacity before the end of 1955. Largest of these is the 52,000-barrel Anglo-Iranian plant at Fremantle. Others are the 25,000 barrel Vacuum Pty. Ltd. plant at Altoona, costing $30 million, and the new 24,000-barrel Australian Oil Refining Ltd. (Caltex) refinery at Kurnell.

The Philippines will have a refinery for the first time late this year when Caltex completes a 13,000-barrel plant at Batangas.

Impact of Abadan on Eastern Hemisphere refined oil markets will not be felt in the immediate future, and it is believed by many that the onetime 500,000-barrel capacity will not be regained within the forseeable future.

No substantial operations will be possible at Abadan for three to six months or longer because of the present condition of the property. Several months ago a group of refinery engineers inspected the plant, but did not make a statement of findings. It is reported, however, that maintenance has not been adequate.

Abdan has been operated on a skimming plant basis at the rate of about 30,000 b/d during much of the period since nationalization. Policy has been to run first one crude still and then another, not to confine operations to a single unit. During the periods of shut-down, maintenance work was done as well as possible with tools and supplies available.

Iranian Government policy was to keep the refinery and oil field staff employed as a make-work project to avoid distress among former AIOC workers. The staff has been engaged largely in maintenance.

Rumors that the equipment was sabotaged and minor items such as nonferrous fittings stolen have not been found to be true during recent inspections.

While many of the Abadan units have seen long service, their obsolescence is not as great as would be the case in the United States or European countries. In the West the labor content of finished products is of growing importance so that larger units, more integration and instrumentation are essential. In the Orient these factors are not so pressing so that obsolescence is not as far advanced at Abadan as in western plants of a comparable age.

A general estimate is that skimming and thermal reforming could be brought up to a capacity of about 100,000 b/d within three or four months.

The plant does have a new cat cracker and a new lube plant which were completed or nearly so just before the break in operations.The wartime aviation fuel plant also is likely to be useful. Only detailed expert studies will reveal how much of the plant can be reactivated and how soon.

MIDDLE AND FAR EAST REFINERY CAPACITY
(Barrels Daily)

COUNTRY	1954	1951
Aden	120,000	.....
Australia	59,740	20,600
Bahrain	186,500	155,000
B. Borneo	47,300	38,000
Burma	3,700	3,500
Egypt	53,000	47,000
Formosa	18,000	.....
India	10,000	5,500
Indonesia	205,300	167,000
Iran	572,100	572,100
Iraq	17,730	9,500
Israel	85,000	83,000
Japan	145,440	68,356
Kuwait	30,000	25,000
Lebanon	11,000	11,000
Pakistan	5,500	4,000
Saudi Arabia	189,000	140,000
South Africa	17,800	2,000
TOTAL	1,759,110	1,351,556

Oil fields and pipelines of southwest Iran.

View of the No. 1 well at Lali field.

NATIONALIZATION of Anglo-Iranian Oil Company facilities in 1951 brought a halt to 50 years of search for oil and development of discoveries under competent British management and deprived the Iranian treasury of £50 million in annual revenue. In the half century since W. K. D'Arcy obtained the original concession from the Persian government, the Anglo-Iranian Oil Co. and its predecessor Anglo-Persian Oil Co. had invested about £18 million ($500 million) in the country.

For some years prior to the confiscatory action, AIOC payments to the Iranian treasury had constituted a third of the government revenue.

In the period between 1933 and 1950, AIOC paid the Iranian treasury directly £98.9 million. Annual direct payments had risen eight fold during the period from £1.8 to £15.95 million. Under the 1949 agreement which the Majlis refused to ratify, AIOC would have made additional retroactive payments for the years 1948-50 totalling an additional £34.4 million. The 1950 rate of direct payment

to the treasury thus would have been nearly £30 million.

Indirect state revenue based on AIOC operations in Persia were very substantial. Foreign exchange on Persian rials was improved through the sale of sterling and profit on the sale was about £7 per year. The government dividends from its stock interest in AIOC brought in 7.5 million rials per year. AIOC employees paid 95 million rials in personal income taxes, and import duties on goods used by the company and its personnel totaled 125 million rials. This supplementary income in 1950 was about £18 million.

Total government income attributable to oil in 1950 was about £34 million on the basis of the 1933 concession and would have been above £50 million for that year had the 1949 agreement been ratified. Under that revision, government oil revenues would have risen to the new 50-50 pattern accepted by other Middle East governments. The state could have undertaken an ambitious 7-year program of public works and assistance to the people. Unfortunately for the Persians, ambitious leaders without knowledge of the complexities of the modern oil industry were determined to tear up the AIOC concession and to oust the company from the country. Government operation of the fields and refineries was to be undertaken. In their ignorance of world trade, the leaders overlooked the fact that oil must be sold before it creates revenue. They failed to appreciate the long years in which the great international companies had been engaged in creating machinery for the transportation of oil to every part of the globe and the facilities for storage, handling and sale of products manufactured from crude.

Effects of the miscalculation have been to deprive the Persian treasury of a minimum of £175 ($490 million) in the three and a half years during which the industry has been at a standstill and of additional sums during the next few years in which the proposed consortium must try to fit Iranian oil into world markets without undue disturbances in other countries.

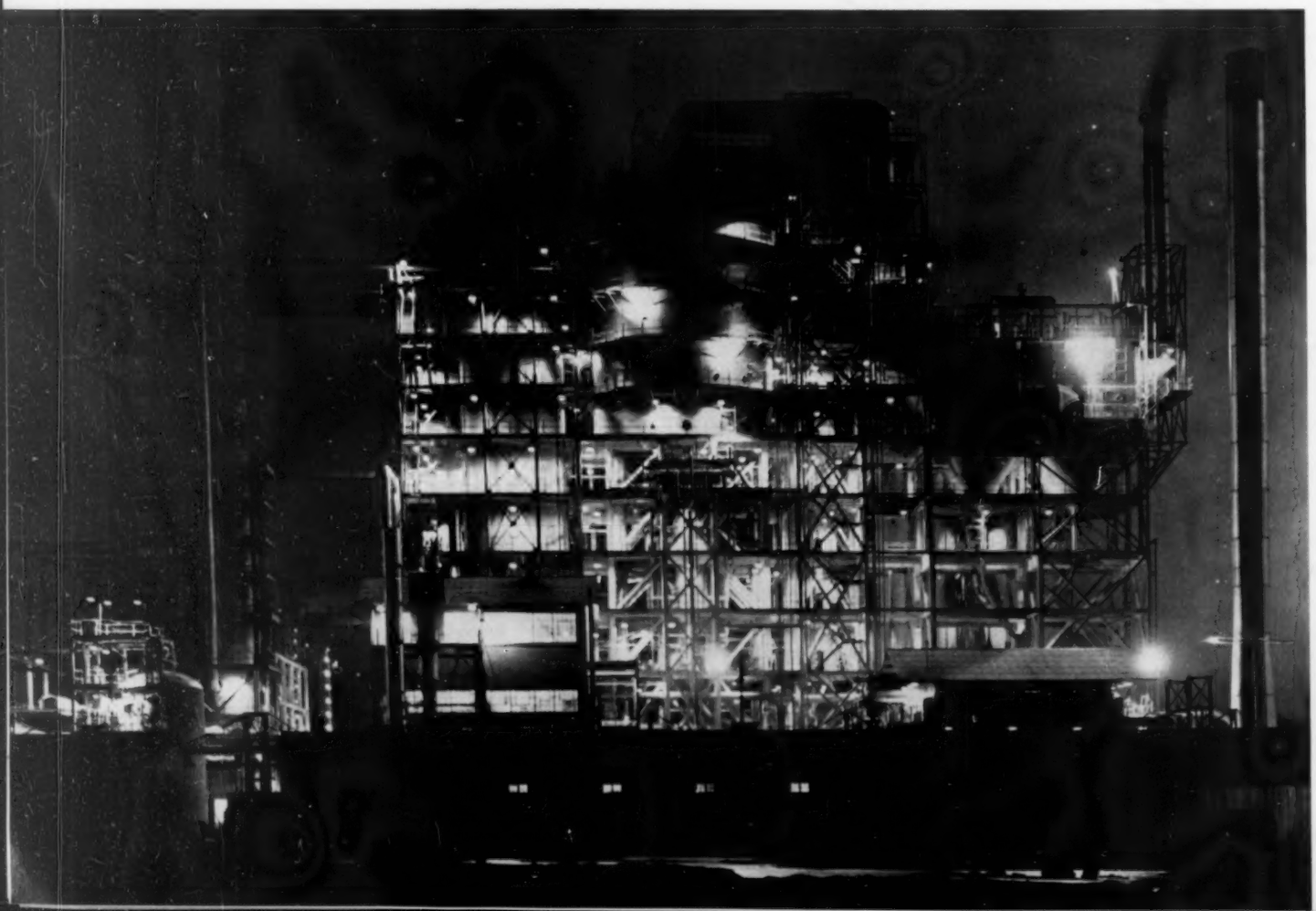
In the competitive struggle for world markets, Persia once had a strong advantage because its fields were found earlier than the other prolific areas of the Middle East. The Masjid-i-Sulaiman field was discovered in 1908, Iraq followed 19 years later in 1927 with Kirkuk, and the first discoveries in Saudi Arabia and Kuwait were not made until 1938. By the time these latter fields were found, Anglo-Iranian Oil Co. had built up a market for 78 million barrels of oil per year. In 1950 this had risen to 243 million barrels. This compared with 126 million barrels from Kuwait, 50 million barrels from Iraq, and 200 million barrels from Saudi Arabia.

At the time of nationalization, it was the theory of the Persian leaders that the properties would be taken over by the Iranians and products sold to independent traders in world markets. To accomplish this the National Iranian Oil Company was formed with a proposed capital of one billion rials ($31 million, or £7.8 million at official exchange rates).

A year ago, in September 1953, the government revealed that the national company was losing about 120 million rials ($1.25 million, £446,000) per month. Between March 15, 1951 and September 22, 1953, the company had accumulated a deficit of $28.7 million.

Commenting on the situation last September, Deputy Premier Dolatobidi in a radio broadcast said that rehabilitation of AIOC facilities would cost $30 to $40 million and require employment of some 600 experts. The lube plant with an annual capacity of 20,000 tons had produced only 800 tons in two and a half years for lack of equipment. The 90,000

The new catalytic cracker at night. Picture was taken a few days before start of operations on April 9, 1951.



kw Abadan power plant was then operating past the time for shut-down. A field power station at Masjid-i-Sulaiman was worn out. A plant purchased in Switzerland could not be used for lack of parts. The same was true of a nearly completed plant at Abadan.

Recent inspections of former AIOC properties have indicated that producing and pipe line equipment is in fairly good condition, but that the Abadan refinery has deteriorated rapidly because of the lack of supplies and equipment. The usual wear and tear on unused facilities has not been checked by proper maintenance. It is the thought of some that $30 to $40 million will be required to get the newer and more useful units of the refinery on stream, but that it will not be feasible to operate other parts of the plant because of their condition and accelerated obsolescence.

Following last September's broadcast, the government issued the following statement:

"An extract of the NIOC's report was made public yesterday and this was the second effective step taken by the government to inform the public of the bitter truth regarding the most important economic and financial source which exists in the country.

"This bitter truth was known to the experts from the beginning, but Mosadegh and his collaborators, who derived considerable advantage for their propaganda by keeping the people in the dark, would never have kept the public informed of real facts even if they had continued in office for another 100 years.

"Now that the truth is known, it presents a very sorrowful story for it shows how the previous government has treated the biggest source of the country's income, how the country has been deprived of its income and what a colossal debt has been created for the people, and it is not known how we are ever going to settle it.

"How can we tolerate the millions borrowed by the NIOC from the Bank Melli and the Ministry of Finance? Where shall we get the funds to pay these back? This debt is additional to what the previous government owed the Bank Melli. The bank has to make up for the NIOC budget deficit of rials 120,000,000 monthly.

"We are of the opinion that the people must carefully study the figures supplied by the management of the NIOC who were appointed by Mosadegh himself and must think of a way out."

The government statement of last September that the people were not permitted to know the true state of affairs also was pointed out in a recent book, "Oil in the Middle East," by S. H. Longrigg. In this volume Brigadier Longrigg wrote that deputies in the Majlis did not have an opportunity to study and debate terms of the agreement and the company was restrained from giving any publicity to its terms.

It is unfortunate also for Persia that income from the oil fields was not channeled into areas which would benefit all of the people in the 40 years of AIOC operations. In general, much of the funds accruing to the treasury were used to maintain the bureaucracy rather than for public works, health, education and improvement in agriculture as has been done in other areas in the Middle East.

Persia has a population of about 16.5 million, and of these no more than a half million were benefitted by oil. These included company employees and those who served them plus those in the government service and those benefitting through patronage. The remaining 16 million largely lived under conditions of great poverty.

The first oil concession in Persia was granted in 1901 to William Knox D'Arcy

A corner of the Kermanshah refinery, northwest Iran.

Part of the Bahmanshir housing estate, one of the many built by Anglo-Iranian for its employees in South Iran.

The X-ray department in the Anglo-Iranian Oil Co. hospital at Abadan.

A vessel unloading at an Abadan cargo jetty.

and covered 500,000 square miles. For seven years the search for oil was continued but in 1908 financial backers in London decided to withdraw their support and dispatched word to the field that the exploration work was to be abandoned. Fortunately there was no radio communication at the time and the Masjid-i-Sulaiman (MIS) field had been discovered before word was delivered. Forty-two years later, when the government took over, MIS was still producing 64,200 b/d. Cumulative production to that date was about 900 million barrels.

Development drilling following the MIS discovery proved the find to be of major proportions and, as a result, the Anglo-Persian Oil Co. was organized in 1909 to exploit the field. Name of the company later was changed to Anglo-Iranian in deference to the late Shah, who caused the name Iran to be used instead of Persia.

Before commercial production from MIS could be undertaken, it was necessary to lay a 133-mile pipe line to the Shatt-el-Arab and to build a refinery at Abadan to process the oil. The pipe line was completed in 1911 with a capacity of 8,500 b/d and commercial production began a full decade after D'Arcy obtained his concession.

Financial requirements of the Persian exploration and subsequent commercial development were extraordinarily large for that period. In 1914, when World War I broke out, the company was given a contract to produce fuel oil for the British Navy and the government assisted Anglo-Persian in expanding its facilities by investing £2 million in its stock. The government's 50 percent interest has continued since that time.

Persian production expanded rapidly during the war, reaching 18,000 b/d by 1917, when it became necessary to enlarge the pipe line system. New capacity was 60,000 b/d to allow for future expansion.

Wildcatting continued during the period between the two world wars. In 1923 Naft-i-Shah, a small field, was found near the Iraq border and subsequently a refinery was built at Kermanshah to supply local markets. In 1928 the company made two major discoveries, the Haft Kel and Gach Saran fields. In 1934 Naft Safid was drilled and in 1937 Agha Jari and Pazanun. Last discovery before the concession cancellation was the Lali field in 1938.

Just prior to nationalization, the various fields were producing a total of 719,000 b/d as shown in an accompanying table.

All fields in Persia thus far discovered are in the Asmari limestone of lower Miocene to Oligocene age covered with an anhydrite caprock usually about 100 feet in thickness. The Asmari lime has a porosity ranging from two to 15 percent, the average being about five percent. The large anticlinal structures have been subjected to intense folding and flexing, thus creating a fractured condition which permits the flow of oil through the reservoir to boreholes.

The Asmari limestone series may be up to 1,500 feet in thickness. The massive beds may be varied with some anhydrite and marly beds. Average thickness of the producing section in the various fields is about as follows:

	THICKNESS IN FEET
Gach Saran	1,500
Lali	1,200
Masjid-i-Sulaiman	1,000
Naft Safid	900
Haft Kel	900
Pazanun	700
Agha Jari	600
Naft-i-Shah	250

Pressures within the oil and gas zones are frequently high and require special drilling techniques and extreme care. Special well heads were employed and pressure drilling practiced in sections where experience showed that high formation pressures might be encountered. In pressure drilling, a light gravity mud was used and mechanical back pressure imposed. Mud dropped its cuttings in a closed pressure vessel or discharged through beans. Lost circulation was a problem here as well as in other Middle East areas. Some wells using heavy mud sustained huge fluid losses before pressure drilling methods were perfected. Expert drillers were required for the techniques and drilling progress was relatively slow, but AIOC engineers felt it necessary to maintain a high safety standard at all times. During AIOC operation about 15 rigs were kept in operation in Iran.

Wells drilled into the Asmari were acidized before being brought on production. Well spacing was made the subject of very careful studies and observation wells maintained a constant check on reservoir conditions to assure maximum ultimate recoveries. There is a high degree of communication throughout the reservoirs which permits a large volume production through a few wells. At the end of 1950 a total of 77 wells were producing in excess of 700,000 barrels of oil daily. Field studies by AIOC engineers over a period of many years produced control data which have been employed in other Middle East producing fields.

Gravity of Iranian crude oils ranges from 32.8 to 39 in the southern fields. The 2-well Naft-i-Shah field near the Iranian border produces 42.8 gravity oil.

Agha Jari, Iran's most prolific field at the time of nationalization, has a gravity of 35.8° API. Haft Kel is 39, Lali 36, Naft Safid 34.4 and Masjid-i-Sulaiman 37.8. Gach Saran is the lowest gravity crude at 32.8.

U. S. Bureau of Mines distillation of Agha Jari crude shows a gasoline plus naphtha yield of 30.8 percent, kerosene distillate 10 percent, gas oil 19.5 percent,

The Agha Jari oilfield, South Iran. In the foreground is small distillation unit built to meet local needs, with multistage gas separators immediately above the column.

lube distillate 14 percent and residuum 24.3 percent. Sulfur content is 1.4 weight percent.

Known reserves of crude in Iran are generally placed at 13 billion barrels.

An accompanying map shows the general pipe line system by means of which oil was brought from the various fields to Abadan and to marine loading docks at Bandar Mashur. The pipe line system was in constant development from the time when the first 10-inch line was laid from MIS to Abadan in 1916. Capacity of the 1,022 miles of line at the time of nationalization was nearly 800,000 b/d. Largest line was a 22-inch outlet for the prolific Agha Jari field to the marine terminal at Bandar Mashur. This terminal handled about 40 million barrels of oil in 1950 through four loading berths. Storage capacity at the terminal was for 1.6 million barrels.

Most of the oil produced in Iran was piped to the great refinery at Abadan. The plant processed 180 million barrels of oil in 1950, producing a full line of products including aviation gasoline and lubricants.

When first shut down, the Abadan plant had an atmospheric topping capacity of 500,000 b/d and vacuum still capacity of 58,000 b/d. Thermal reformers were capable of processing 75,000 b/d of naphtha and a 25,000 b/d fluid cat cracker was in operation. The aviation gasoline plant was equipped with alkylation and isomerization units with a throughout capacity of 8,500 b/d and a 1,000 b/d codimer plant. Lube facilities included MEK, furfural and propane units with a capacity of 400 b/d. In the MIS field was a topping plant in which products especially needed could be produced while the remainder could be recycled back to the producing formation.

ANGLO-IRANIAN OIL COMPANY, LIMITED

	Crude Oil Production In Iran (tons)	Royalty Payments To Iran
1913-1932	58,712,657	£12,497,728
1933	7,086,706	£ 1,812,442
1934	7,537,372	£ 2,189,853
1935	7,487,697	£ 2,220,648
1936	8,198,119	£ 2,580,205
1937	10,167,795	£ 3,545,313
1938	10,195,371	£ 3,307,478
1939	9,583,286	£ 4,270,814
1940	8,626,639	£ 4,000,000
1941	6,605,320	£ 4,000,000
1942	9,399,231	£ 4,000,000
1943	9,705,769	£ 4,000,000
1944	13,274,243	£ 4,464,438
1945	16,839,490	£ 5,624,308
1946	19,189,551	£ 7,131,669
1947	20,194,838	£ 7,103,792
1948	24,871,058	£ 9,172,269*
1949	26,806,564	£13,489,271*
1950	31,750,147	£16,031,735*
1951	16,177,000	£ 8,326,446

*Had the supplemental agreement of 1949 been ratified these payments would have been increased to £18,667,822 in 1948, £22,890,261 in 1949 and £30,000,000 (approx.) in 1950.

PRODUCTION OF IRANIAN OIL FIELDS PRIOR TO NATIONALIZATION

Field	Average Production b/d	Average Depth of Wells Feet	Reservoir Pressures psi
Lali	18,900	7,500	3,050-4,000
Masjid-i-Sulaiman	64,200	2,100	450- 750
Naft Safid .	27,700	5,250	3,000-4,000
Haft Kel ..	200,000	3,600	1,175-1,800
Agha Jari .	350,000	6,900	3,150-4,500
Gach Saran	54,200	5,300	2,750-7,500
Naft-i-Shah.	4,000	2,700	.....
	719,000	4,700	

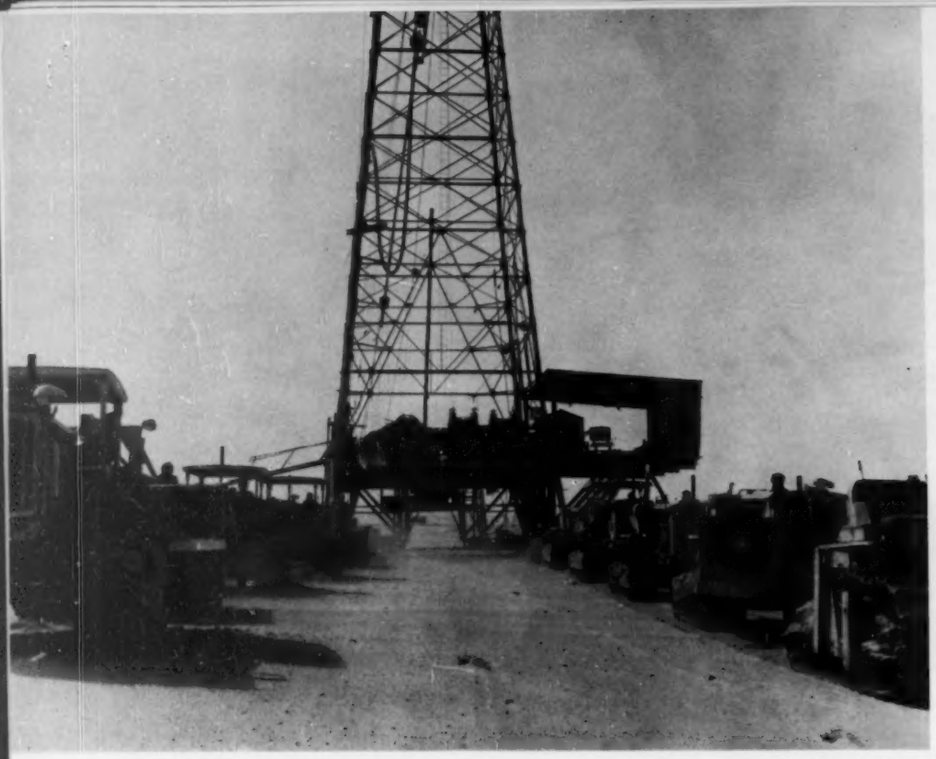
With this plant either fuel oil or light oil production could be expanded. A small refinery at Kermanshah processed crude from two wells in the Naft-i-Shah field on the Iraq border to supply local requirements in that area.

In common with other concessionaires in the Middle East, AIOC maintained a policy of maximum employment of nationals. At the time of nationalization there were about 55,000 Persians on the AIOC payroll—more than 90 percent of the total number employed.

Before World War II the company had embarked on an ambitious housing program for employees which was interrupted by the hostilities. At the close of the war this program was resumed and 9,500 houses were built between 1945 and 1951. The houses were equipped with modern sanitation, water, heat and light. These were facilities not previously enjoyed by workers in any part of the country.

AIOC was a pioneer in employee welfare work in the Middle East. Supplementing the housing, the company built schools, recreational and health installations. Buses were provided for transportation of both school children and workers. Dental and health dispensaries ministered to the minor health needs of families and hospitals were provided for more serious trouble. In 1950 the company spent $5.6 million for health services and a similar sum for education. Agricultural aids were offered in the company's active area.

The standard of living of Iranian employees of AIOC in 1951 at the time of nationalization was infinitely higher than in other parts of the nation and, as previously mentioned, a third of the entire cost of the government was borne by oil payments. The loss to the government and people in the past three years is incalculable and it will obviously be a considerable time before the consortium which is to take over the operation will be able to offer benefits of similar proportions.



Skidding a rig in the Burgan field.

Kuwait Oil Co. camp for employees at Ahmadi Ridge.

KUWAIT

THE SHAIKHDOM OF KUWAIT today is the richest nation in the world for its size in terms of gross national product and potential future natural resource production. The tiny country, with only 6,500 square miles of territory, has reserves of petroleum estimated to exceed 20 billion barrels, roughly two thirds as much oil as the United States has in sight.

Ten years ago the country was an arid waste unable to produce enough food to support its inhabitants. Even drinking water had to be imported. Nomads of the desert led a precarious existence grazing their flocks on sparse vegetation about the few areas where brackish water was available. The capital city, with 80 percent of the nation's population, supported itself by fishing, boatbuilding and coastal trade.

Today there are jobs for everyone in the country in the oil industry or in private trade or services. An enlightened government is spending its current high income to improve the health, education and housing of the people. The standard of living has risen at a remarkable rate.

This is not the first period in the history of Kuwait in which its people enjoyed great prosperity. There is evidence that in ancient times it was a fertile area similar to the valleys of the Tigris and the Euphrates, where early cultures flourished. Some place Kuwait within the borders of the legendary "Garden of Eden."

Changes in the climate permitting encroachment of the desert limited the population for many centuries to a few nomadic tribes who brought their flocks there when the rains induced a quick growth of forage.

Kuwait also has had its periods of tumult and adversity. It once was a battle ground of the contending armies of Persia and Arabia. In the fourth century

small in area but rich in oil reserves

A.D., Shafur II of Persia caused a moat to be dug from the Euphrates to Kuwait bay as a defense against the Arabs. Kuwait City was walled as a protection against desert warriors in modern times.

Power politics of the great nations of Europe and Asia have affected the Shaikhdom largely because of its strategic position at the head of the Persian Gulf and because it has a good harbor for shipping. Greece, Turkey, Russia, Germany and Britain all have interested themselves in the country. Kuwait was proposed as the western terminus of a railroad before the Suez Canal was dug and later by Germany in its period of expansion to the East before World War I. From time to time Kuwait rulers acknowledged ties with Turkey, but these had been broken long before the "Red Line Agreement" was made in 1928.

Kuwait has been an independent nation under British protection since 1899, when Britain agreed to defend the Shaikhdom against foreign aggression. It has been necessary to make good on the promise twice since the turn of the century when Turkey made threatening gestures.

Shortly before the outbreak of World War I, Shaikh Sir Mubarak Subah, Kuwait ruler at the time, showed his gratitude by writing to the British Political Resident in the Persian Gulf offering "to show the place of bitumen in Burgan and elsewhere and if . . . there seems hope of obtaining oil therefrom, we shall never give a concession in this matter to any except a person appointed from the British Government."

This promise was kept 20 years later when Gulf Oil Corporation sought an oil concession in Kuwait after having relinquished its claim to rights on Bahrain Island because of the Red Line Agreement. In order to obtain an interest, it was necessary for Gulf to set up a British Corporation and associate itself with Anglo-Iranian Oil Co. in the present operating partnership.

The modern state evolved about 200 years ago when three clans decided to settle on Kuwait bay at the site of the present city of Kuwait. The wandering spirit of the people was transferred from the desert to the sea. The Kuwaitis became shipbuilders, traders, pearl fishermen and pirates. Except for this latter occupation the people principally followed these lines of endeavor until oil operations began. Today several thousand are employed by Kuwait Oil Co. in clerical, mechanical and technical jobs.

The present regime in Kuwait has been in power since 1756. The dynasty was established by Shaikh Subah, who came in from the region of Basra to seize the area. The present ruler, His Highness Shaikh Sir Abdulla Salim al-Subah, the 11th in the line, became Shaikh on Jan. 29, 1950 following the death of his cousin, Shaikh Sir Ahmad al-Jabar al-Subah.

Kuwait began its modern period of prosperity under Shaikh Ahmad, who established friendly relations with his neighbor Ibn Saud of Saudi Arabia and set up the neutral zone between the two countries. He renewed the traditional friendship of the state with Britain and negotiated the present oil concession.

Relations between Kuwait Oil Co. Ltd. and the rulers of the Shaikhdom have been uniformly cordial throughout the period of the original negotiations, subsequent renegotiation and the development era, when friction might have been expected because of the wide differences in racial, cultural and religious backgrounds of the Kuwaitis and the foreign concessionaires. When the pattern of concession agreements was being changed in a number of countries to inject a taxation angle on top of the royalty, the Kuwait agreement was revised to the prevailing pattern. The term of the concession was extended 17 years to the year 2026 and the companies were granted off-shore rights. The company agreed to a taxation formula which would bring state revenues from oil up to half of the profits of the operation.

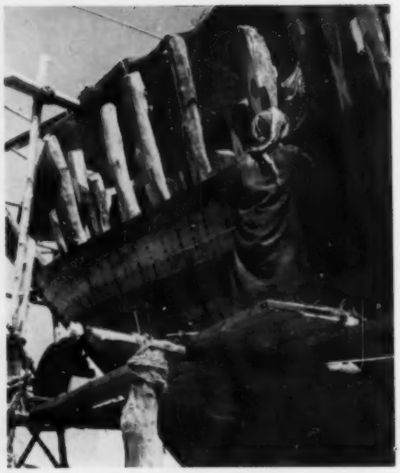
To a considerable extent the rapid expansion of Kuwait as the fifth largest oil producing country in the world is a by-product of the confiscation by Iran of the field installations, pipe lines and refinery of Anglo-Iranian Oil Co. When the Persian government repudiated its agreement with the British company and nationalized its facilities in 1951, the world was faced with an immediate and pressing emergency. Demand for oil in the eastern hemisphere was rising at a rapid pace as the wounds of World War II were being healed. The war in Korea also had stimulated oil consumption in both eastern and western hemispheres.

With 700,000 barrels per day of Persian oil withdrawn from the market overnight, it became imperative to develop new production as rapidly as possible. Kuwait and Saudi Arabia were called on to supply the immediate deficiency in crudes. Iraq could not be relied upon at the outset because its fields were inland and transportation was not available.

Production of crude in Kuwait jumped 60 percent in 1951, and in 1952 was more than double the volume lifted before Persian fields were shut in. Completion of additional pipe lines to move Iraq oil to the Mediterranean seaboard and to Fao at the head of the Persian Gulf brought large quantities of new oil into world markets in 1953 so that the rate of increase in Kuwait and Saudi Arabia was less abrupt.

Both partners in the Kuwait enterprise were fortified in making the large investment necessary for the development by long term marketing agreements with companies requiring large volumes of crude oil to supply customers. Gulf Oil Corporation particularly needed an outlet for crude since it had previously devoted most of its energies to United States domestic markets. Prior to the Persian nationalization, Anglo-Iranian possessed

Cleaning an evaporator vessel at the sea water distillation plant at Mina al-Ahmadi.



Boatbuilding continues as an important occupation in Kuwait.

Boys at a state secondary school, where European clothes are now worn.

ample supplies of crude to supply its global markets and was in a position to sell oil to other international marketers.

Two sales agreements thus paved the way for Kuwait expansion prior to 1951. Both were negotiated in 1947, long before the Persian controversy. Gulf executed a long-term contract with the Shell group of companies for the sale of crude in increasing volume over a 22-year period. At the time this sale was made, Shell did not have an independent operation in the Middle East. Its supply was limited to 23.75 percent of the output of Iraq fields and a share in Egyptian output which was too small to be exported. Since that time Shell has taken an offshore concession in the Persian Gulf which is not yet in production. Qatar, in which the group also has a 23.75 percent interest, is producing substantial quantities of oil and Shell's share of Iraq oil has grown from about 20,000 b/d in 1947 to nearly 150,000 b/d this year.

With Iran fields producing 440,000 b/d in 1947, Anglo-Iranian negotiated an arrangement with Standard Oil Co. (N.J.) and Socony Vacuum Oil Co., Inc. under which it could sell crude from either Kuwait or Persia at the seller's option. The three companies agreed to build a big-inch pipe line from the head of the Persian Gulf to the Mediterranean. At that time the pipe line seemed necessary because of the world-wide shortage of tankers. Jersey and Socony undertook to buy about a billion barrels of crude from Anglo-Iranian over a 20-year period and to supply 39.1 percent of the capital required for a 535,000 b/d 34-36-inch pipe line. Middle East Pipe Lines Ltd. was organized to build the line and right-of-way negotiations were undertaken.

Syria granted an easement for the proposed line, but Iraqi authorities were unwilling to permit the line to traverse that country. Refusal to grant the right-of-way was based on the fear that the line would decrease the outlet for Iraq crude. As it has turned out, the lack of a pipe line outlet has not materially interfered with the marketing of Kuwait oil. The glut in the post-war tanker market has reduced ocean rates to a point where water transportation to European markets through Suez is competitive with Trans-Arabian pipe line charges. At the moment the differential favoring pipe line transportation is about six cents per barrel.

Surface of the Shaikhdom of Kuwait consists largely of windblown sand and residual gravel. Outcrops are few, except in the Burgan hills where Miocene sandstones are exposed at 250 to 300 foot elevations. Here also is the bitumen seepage to which Shaikh Mubarak referred to in his offer to the British in 1913.

Present ruler of Kuwait: His Highness Shaikh Sir Abdulla al Salim al Subah, K.C.M.G., C.I.E.

KUWAIT HIGHLIGHTS	DATE
Kuwait Oil Co. registered in London	February 1934
Concession granted	December 23, 1934
Geological work started	March 1935
Bahrah-1 spudded	May 30, 1936
Geophysical survey started	September 1936
Bahrah-1 abandoned	April 1937
Burgan-1 (discovery well) spudded	October 16, 1937
Burgan-1 (discovery well) completed	May 14, 1938
Eight additional wells drilled into pay sands by	April 1942
Operations suspended because of war and wells plugged	July 1942
Preparations for reopening wells begun	June 1945
First well (Burgan-5) recompleted	November 13, 1945
Production from Burgan Field started	June 1, 1946
First oil loaded on board of a tanker	June 30, 1946
First Magwa well spudded	August 23, 1951
First Ahmadi well spudded	August 21, 1952
First billion barrels of crude oil was produced on	October 7, 1953

CRUDE OIL PRODUCTION IN NET BARRELS

1946	5,927,979
1947	16,227,906
1948	46,546,795
1949	89,930,444
1950	125,722,396
1951	204,909,662
1952	273,432,895
1953	314,592,486
Total	1,077,290,563

NUMBER OF WELLS AND FOOTAGE DRILLED IN KUWAIT

	Number of wells completed		
Year	Producers	Dry Holes	Footage
1936			5,984
1937		1	3,522
1938-1942	9	none	42,175
1946			204
1947	5	"	36,108
1948	24	"	122,722
1949	50	"	245,737
1950	12	"	50,883
1951	19	"	86,952
1952	21	"	101,018
1953	17	"	80,187
Totals	157	1	775,492

PRODUCING WELLS BY SEGMENTS AS OF DECEMBER 31, 1953

Burgan	131 wells
Magwa	23 wells
Ahmadi	3 wells
Total	157 wells

The Burgan area was second choice of company geologists when development work was undertaken. First test was drilled in 1936 in the Basrah area north of Kuwait Bay. The well was abandoned at 7,950 feet and further geological and geophysical studies were undertaken. As a result of this work, the second wildcat was located 28 miles south of the bay and 14 miles inland. Producing sand was penetrated at a depth of 3,672 feet in April 1938.

Despite the friendly relations between Britain and the rulers of Kuwait and the presence of the Burgan seepages, the Shaikhdom was not favored as a source of important oil production by most geologists in the early part of the century. Discoveries in both Iran and Iraq had been in Miocene and Oligocene which were at or near the surface in Kuwait. Later theory favored exploration of the Cretaceous, where it could be found at feasible depths, and as a result the first discovery of Cretaceous oil was made by Standard of California interests on Bahrain Island in 1934 shortly before the Kuwait concession was granted.

Cretaceous sand fields still are in the minority in the Persian Gulf area. Part of the oil at Basrah comes from this type of formation. The Wafra field in the Kuwait Neutral Zone and the Safaniya field offshore in northern Saudi Arabia are the other Cretaceous fields beside those in Kuwait and Bahrain.

Kuwait oil is found in three sand members. Cap rock is a shale interval between the upper and middle Cretaceous horizons. The sand members also are separated by shaly intervals. The two lower members of the series are the most productive.

Thickness of the middle Cretaceous at the crest of the Burgan field is roughly 1,000 feet. The lowest zone has a thickness of more than 500 feet above the oil/water contact at minus 4,460 feet. The third zone, which is most prolific, has a crest thickness of about 300 feet. Average producing thickness is 200 feet.

A deep test was drilled to explore lower horizons. This well was carried to 13,800 feet before being plugged back to the Burgan sand since commercial production was not obtained at lower levels.

Following the initial Burgan discovery, eight step-out wells were drilled between 1938 and 1942 and a dry wildcat was drilled near Madaniyat. War conditions forced a shut-down in operations in 1942.

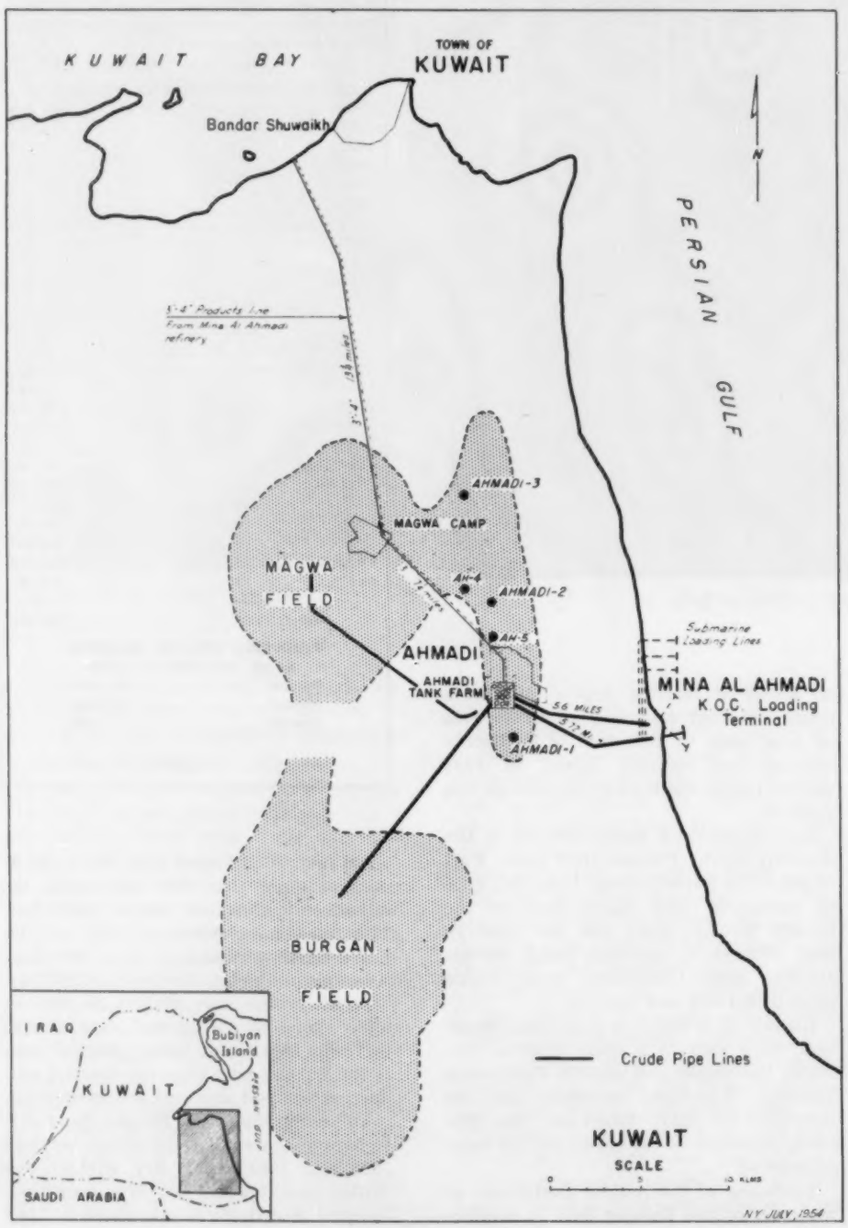
All wells were plugged with cement to prevent possible operation by an invader.

At the end of the war, cement plugs were drilled out, the wells reconditioned and production undertaken at an initial rate of 30,000 b/d. The first cargo of Kuwait oil was shipped on June 30, 1946. The following year both partners negotiated the major sales agreements previously mentioned, and production rose steadily. The two rigs running in 1946 were supplemented with others until 12 were running by 1949.

In 1951 oil was discovered in the Magwa area some six miles north of the Burgan field. Since that time step-out drilling has enlarged the known productive area there to more than 60,000 acres.

Next discovery was at Ahmadi Ridge in 1953. This also is being developed to determine its potentialities. All three areas produce from the middle Cretaceous found at the same depth. Drilling to date does not reveal whether the three can be considered as a single field. This possibility cannot be ruled out at present, but there may be saddles between two or all of the three.

Prior to the Magwa discovery, Burgan was considered to be ovoid in shape, about 14-15 miles long by nine miles in width. The final shape may be different, however. Initial drilling on the structure followed a 600-acre pattern, but there now has been some fill-in drilling on the flanks of the dome. Wells are completed as dual producers with oil flowing through both casing and tubing from separate sands. Well-head pressure is about 600 psi.



Surface conditions in this producing area are such that rigs can be skidded from location to location in an erect position.

Oil produced in the field is concentrated in several de-gassing plants where well pressure is stepped down in about seven stages to atmospheric. Natural gas recovered is used for pumping, refining fuel, salt water evaporation and other domestic use.

Oil from the 3,850,000-barrel tank farm at Ahmadi flows by gravity to the KOC loading terminal at Mina al Ahmadi about six miles to the east. Located also at Mina al Ahmadi is the 30,000 b/d Kuwait refinery which supplies domestic oil and asphalt requirements of the Shaikhdom and bunkers for ships.

An important installation at this point is the sea-water evaporation plant capable of producing 600,000 gallons per day of distilled water for company and employee use and its accompanying 400,000 lb/hr. boiler plant. Salt water distillation was undertaken since no fresh water is available closer than the Shatt el Arab 90 miles away. Six three stage evaporator units have been erected requiring 55,000 lb/hr of steam for operation. The power plant is rated at 22,500 kilowatts.

Tanker loading facilities at Mina al Ahmadi involved the construction of a 4,140-foot jetty to supplement the submarine loading lines originally installed. The jetty now can berth eight supertankers or six tankers and two cargo vessels, and the submarine lines can load five more tankers at the same time. More than a million barrels of crude have been loaded out in a single 24-hour period through the 13 berths.

Construction of the pier required the importation of 38,000 tons of material. More than 130,000 cubic yards of stone was hauled from quarries 17 miles inland to construct a breakwater for a harbor adjacent to the pier. A quarter of a million cubic yards of sand and silt was excavated to provide sufficient depth for vessels calling at the port.

Kuwait Oil Co. Ltd. has made a very large investment in housing, health and recreation facilities at Ahmadi. Permanent houses have been built for staff and other employees. The company hospital at Magwa now has more than 200 beds. The medical and surgical staff is supplemented by a clinic for dental surgery. A mosque was built by the company so that Kuwaiti employees would be provided with a fitting place of worship.

Maximum employment of Kuwaitis is a fixed policy of the company. To implement this policy, a training center has been built at Magwa at which Kuwait employees may learn various skills. Operation, maintenance and repair of motor vehicles and other equipment is taught. Children of employees are also offered educational opportunities. Promising young men are being given advanced education at foreign universities.

The Kuwait state distillation plant, which recovers 1.2 million gallons of potable water per day from sea water.

A street scene in Kuwait town.

Although His Highness Shaikh Abdulla al Salim al-Subah is an absolute ruler in the oriental tradition, he has given clear evidence in the four years he has been in power that the welfare of his people is his primary concern. The great revenues flowing into his treasury are being employed to raise the standard of living of the Kuwaitis in many directions.

The lack of potable water in Kuwait town is being remedied by the installation of a 1.2 million gallon seawater distillation plant. Consideration has been given to the digging of a canal to bring fresh water from the Shatt al Arab below the confluence of the Tigris and Euphrates, but this requires an international agreement with the Iraq government.

Kuwait's public works department is engaged in widening streets, installing water and sewer lines and rebuilding housing to modern standards. Port facilities at Kuwait Bay are being improved.

Public health is being served by the government through modern hospitals, free clinics and trailer dispensaries which bring aid to the people. Lung diseases have been common in Kuwait, and a special hospital has been built for pulmonary patients. There is an eye hospital and a large general hospital. Spread of disease through insect carriers is being minimized through DDT spraying by the public health service in homes, stables, and stores. All of these health services are free or offered at only a token charge. Even the domestic animals are offered veterinary treatment at what has been called the "cow hospital."

Free schooling is provided by the government for girls as well as boys, an innovation in the area. Foreign teachers have been brought in to supplement the supply of qualified Kuwaiti educators. A secondary school for boys is being supplemented by a vocational training school. The government sends promising students outside the country to colleges and universities. All this is free, including lunches, clothing and transportation.

The Shaikh himself is modest in his way of life and does not tolerate waste on the part of his associates in the government. Heads of the various services are well paid and are intensely interested in the work they are doing.

In Kuwait, oil has bettered the lot of all the people. With the great reserves of petroleum to be produced in the future and the intelligent use to which revenues are being put, many generations of Kuwaitis will live a better life. The NEUTRAL ZONE, an area of about 2,000

(Continued on page 160)

Iraq Petroleum Company holds central position in Middle East

IN JUNE 1929, the Iraq Petroleum Company Ltd., as such, came into being, having previously existed as the Turkish Petroleum Co., which was registered as a British company in 1912 after the reorganization of African and Eastern Concessions Ltd., a British-German company formed in 1911 to negotiate concessions with the Turkish government which followed the overthrow of Abdul Hamid's government in 1910.

Turkish Petroleum Co. was reorganized in 1914, the shareholding then being divided D'Arcy Exploration Co. 50 percent, Anglo-Saxon Petroleum Co. 25 percent and Deutsche Bank 25 percent. C. S. Gulbenkian played an active part in the negotiations leading to this reconstruction, and the D'Arcy Exploration Co. and Anglo-Saxon Petroleum Co. each held 2.5 percent of the total stock for him as a "beneficiary 5 percent interest without voting rights."

The agreement on this basis, signed at the British foreign office on March 19, 1914, contained a clause stating that "none of the signatories to this agreement will act independently, directly or indirectly, in the production or manufacture of crude oil" within an area described as "The Ottoman Empire."

When World War I began, in August 1914, the Deutsche Bank's share in the company was taken over by the British custodian of enemy property, but since Mesopotamia was under enemy occupation during most of the war, the company was inactive.

After the war, the German share in the company was assigned to France by the San Remo agreement of April 24, 1920, but this brought a protest from the state department of the United States on May 12 against the exclusion of American oil interests from Mesopotamia.

This protest led to the re-organization of the Turkish Petroleum Co. in order to include American interests who were grouped together as the Near East Development Corp. This group included the Atlantic Refining Co., Gulf Oil Corp., Pan American Transport and Trading Co., Standard Oil Co. of N. Y. (later Socony-Vacuum Co., Inc.) and Standard Oil Co. (N.J.).

In order to allow for this American participation, the D'Arcy Exploration Co. surrendered half its original holdings in return for a royalty of 10 percent on all the oil to be produced, which royalty was reduced to 7.5 percent in 1931.

The set-up of the Turkish Petroleum Co. after this further re-organization was:

D'Arcy Exploration Co.	23.75%
The Anglo-Saxon Petroleum Co. (Royal Dutch/Shell)	23.75%
Cie. Francaise des Petroles	23.75%
Near East Development Co.	23.75%
C. S. Gulbenkian	5.00%
	100.00%

In July, 1928, a group agreement was signed whereby the participants in the company agreed to act only through jointly-owned operating companies in all matters concerning the exploration for and production of oil within an area defined on a map by means of a red line, this area corresponding approximately to the former limits of the Ottoman Empire.

It was further stipulated that this undertaking, to which was given the name "The Red Line Agreement," should be construed according to and be governed by English law.

Under it, all crude oil produced had to be offered at cost, plus one shilling per ton to each of the participants in proportion to their holding in the company. The agreement was terminated by mutual consent in 1948.

As mentioned earlier, the name of the company was changed in June 1929 to Iraq Petroleum Co. Ltd., and in 1931 the interests of the Near East Development Corp. were acquired in equal parts by Standard Oil Co. (N.J.) and Socony-Vacuum Oil Co., Inc. forming the present set-up of the Iraq Petroleum Co. which is as follows:

Anglo-Iranian Oil Co. Ltd.	23.75%
The Royal Dutch/Shell Group	23.75%
Cie Francaise des Petroles	23.75%
*Standard Oil Co. (N.J.)	11.875%
*Socony-Vacuum Oil Co., Inc.	11.875%
C. S. Gulbenkian	5.00%
	100.00%

*Still acting as Near East Development Corp.

In 1931, an amending agreement limited the Iraq Petroleum Co.'s concession to the provinces of Baghdad and Mosul east of the Tigris, the concession to run for 75 years from March 14, 1925.

In 1932, a concession over the whole of Iraq west of the Tigris and north of latitude 33 was acquired by the British Oil Development Co. This company was bought up in 1935 by the group constituting the Iraq Petroleum Co. which then organized the Mosul Petroleum Co. to operate the concession which runs for 75 years from May 25, 1932.

In 1938, the Basrah Petroleum Co., with the same set-up as the Iraq Petroleum Co., was granted a concession over all of Iraq not covered by the Iraq and Mosul concessions, this concession to run for 75 years from November 30, 1938.

Other concessions held by Iraq Petroleum and its associated companies are:

Jordan Petroleum Co. Ltd. covers the whole of the kingdom of Trans-Jordan for 75 years from May 10, 1947.

Petroleum Development (Trucial Coast) Ltd. covers six concessions and one exploration permit from the Rulers of the Trucial Coast, of which the boundaries are largely undefined. Agreement runs for 75 years from various dates in and near 1937.

Petroleum Development (Qatar) Ltd. (now Qatar Petroleum Co. Ltd.) embraces the whole of the Qatar peninsula for 75 years from May 17, 1935. The existing agreement between the government of Iraq and the Iraq Petroleum Co. and its associates was signed on February 3, 1952 by His Excellency Abdul Majid Mahomond, the minister of economics, on behalf of the Iraq government, and H. S. Gibson, managing director of the Iraq Petroleum Company and its associates. It was approved by the Iraq Chamber of Deputies on February 14, 1952 and was ratified by the Senate on February 17, 1952, its terms being retroactive to January, 1951.

The agreement concluded a series of friendly negotiations which had begun in 1950 between the interested parties and resulted in equal sharing between the government and the oil companies of profits accruing from the production and export of petroleum from Iraq.

The companies guaranteed to produce certain minimum quantities of oil from their fields; production by the Iraq Petroleum Co. and the Mosul Petroleum Co. shall be at least 22 million tons *per annum* by the end of 1954, and an annual production of eight million tons is required of the Basrah Petroleum Co. by the end of 1955, making a total production of 30 million tons from Iraqi fields.

The agreement also provides that the Iraq government, as part of its 50 percent share of profits, shall be entitled to receive in kind 12.5 percent of the oil available for shipment by each of the companies concerned, and the government has the option of selling all or part in the open market or calling on the oil com-

panies to buy it back at posted seaboard prices.

In addition the Iraq government is assured that in all circumstances except "force majeure," its total income from oil company operations shall not be less than 25 percent of the seaboard value of all crude oil exported by Iraq Petroleum Co. and Mosul Petroleum Co. plus 33 1/3 percent of the seaboard value of oil exported by Basrah Petroleum Co.

The first field developed in Iraq was Kirkuk. The discovery well of this field was Baba Gurgur No. 1, which was brought in on October 14, 1927 at 1,500 feet as a gusher, with an estimated initial production of 80,000 barrels per day. In the Quiyarah field of Mosul Petroleum Co., oil was struck on October 13, 1927 at a depth of 780 feet, the initial production being 4,000 barrels per day. This was heavy crude with a gravity of 11°Be, highly sulfurous and with a solid bitumen content of about 55 percent. Several wells were drilled in this vicinity, all giving heavy oil at shallow depths.

Test drilling was carried out to greater depth in the area of Ain Zalah, about 40 miles northwest of Mosul, and in 1939 light oil was found at a depth of 5,100 feet. By the spring of 1941 four more producing wells had been drilled to depths of 5,100-6,000 feet, but with the coming of war these were all plugged as a defense measure and operation ceased until 1947.

An exploratory well in the Butmah field found commercial production at 3,600 feet in August 1952. A second well has since been drilled and brought into production.

Drilling of the first well in Zubair field of Basrah Petroleum Co., which is located about 20 miles southwest of Basrah and about 80 miles north of the Burgan field of the Kuwait Oil Co., began in February 1948. Shows of heavy sulfurous oil were encountered at shallow depths. These were not commercially attractive, but in March 1949 three pay horizons were located at depths between 10,500 and 11,100 feet which gave good production.

The Roumaila field is located 20 miles west of Zubair. Exploratory drilling commenced on February 21, 1953, and oil sands were penetrated in the same geological formation as at Zubair, at a depth of over 10,000 feet, in October 1953.

Qatar Petroleum Co. Ltd., owned by the same interests constituting IPC, was formerly called Petroleum Development (Qatar) Ltd. An exploratory well was started in October 1938, and found pay in the No. 3 limestone of the Zekrit formation in January 1940 at a depth of about 6,000 feet. The first well gave an estimated initial production of 5,000 b/d at a wellhead pressure of 367 psi.

A second well, 10 miles south, completed in March 1940, gave similar results. A third well, 2½ miles east of the first, was completed in edgewater in both No. 3 and No. 4 limestones in May 1942.

New bridge over the Lesser Zab linking the Baba and Avanah domes. One thousand four hundred feet long, the bridge conveys crude oil from the Avanah district north of the river to the process plant at Baba twenty miles away.

View of the Ain Zalah station of Mosul Petroleum Co. Ltd.

Draftsman's class in the Iraq Petroleum Company's industrial training center at Kirkuk.

A group of home ownership houses of Iraq Petroleum Co. Eighty-two houses were finished in 1953, with twenty more under construction at the end of the year.

Owing to the war, operations were suspended, the wells plugged and equipment removed. Operations were resumed in 1947.

Petroleum Development (Trucial Coast) Ltd. drilled a dry hole at Ras Sadr in the Abu Dhabi sheikhdom in 1950-51; a second, also dry, was drilled at Jebel Ali in the adjoining sheikhdom of Dubai in 1951-52.

Another exploratory well drilled at Murban in Abu Dhabi struck oil in December 1953. The characteristics of this well are now being studied before further exploration work is carried out in this section.

Table I gives the number of wells drilled by the Iraq Petroleum Co. and its associates. Operations were largely suspended during the war, and it will be noted that no drilling at all took place in 1943.

Prior to 1939, only a bulk figure is given for the wells drilled on the Kirkuk field between the discovery well in 1927 and 1939; many of these wells were plugged when war began and only such production as was necessary to maintain the life of the wells took place.

COMPANY	FIELD	DATE OF DISCOVERY	
I.P.C.	Kirkuk	October	1927
M.P.C.	Ain Zalah	July	1939
	Butmah	August	1952
B.P.C.	Zubair	March	1949
	Roumaila	October	1953
Q.P.C.	Dukhan	January	1940

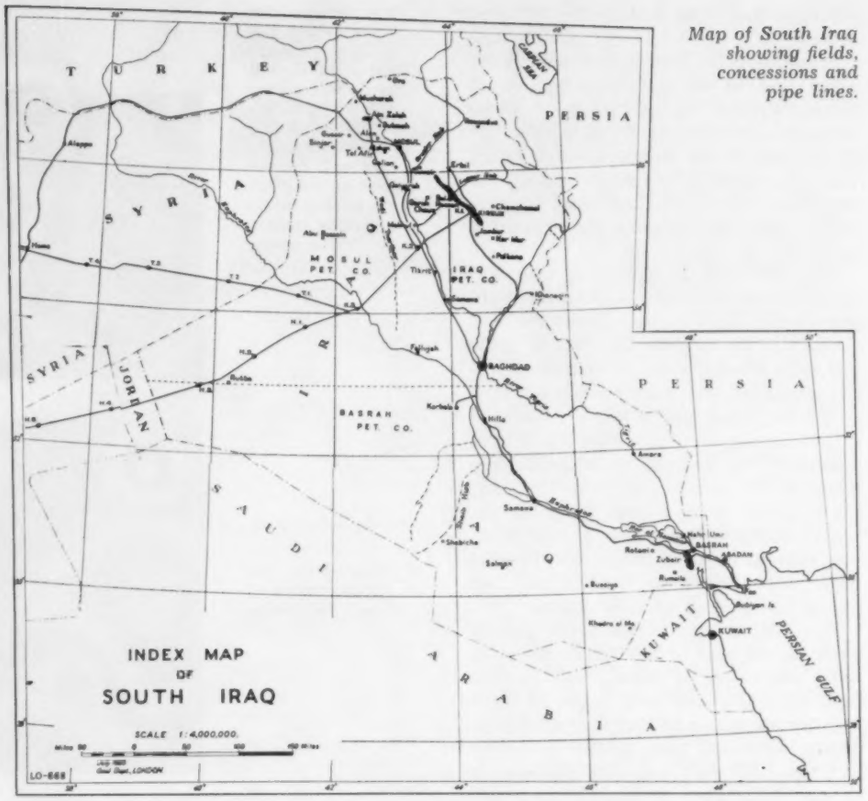
It will be seen from Table II that the minimum production of 22 million tons guaranteed by the end of 1954 from the Iraq Petroleum Co. and the Mosul Petroleum Co. fields in the 1951 agreement was exceeded by the end of 1953, and according to the figures of cumulative production for the first six months of 1954 will be further exceeded by the end of the year.

The cumulative figure for the first six months of 1954 for the Zubair fields shows a definite increase over 1953, and there seems no doubt that the agreement figure of eight million tons by the end of 1954 will be attained.

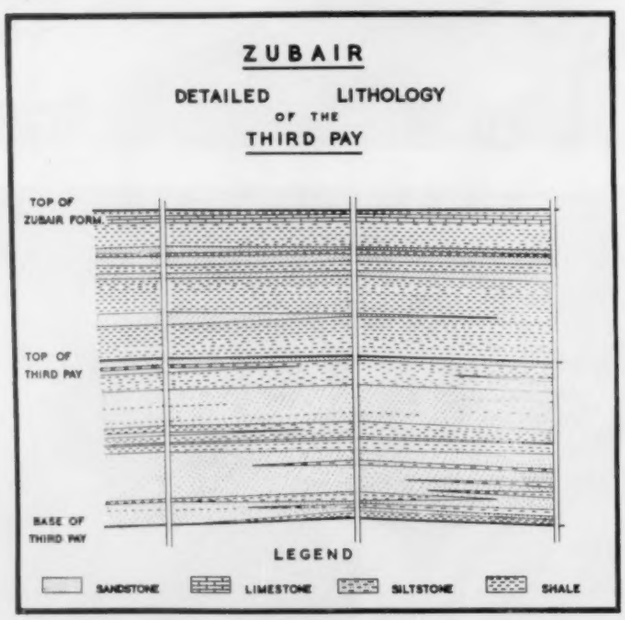
By the end of June 1954 the total number of wells completed at Zubair was 37, and number 38 had reached a depth of 4,500 feet. In that month the third degassing station of the field was put into commission with a maximum capacity of more than 80,000 b/d. At the time of coming into operation seven wells were linked to it and two more are to be tied in.

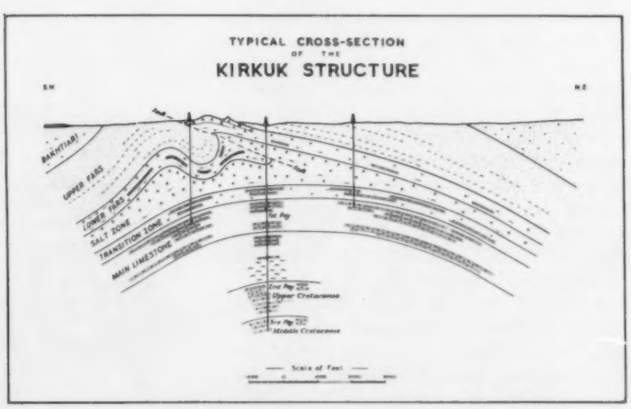
On May 30, 1954 a record in oil production in the field was established, 112,000 barrels being produced in 24 hours. Present production based on the months of May and June is at the rate of over 4.5 million tons *per annum*.

Drilling is proceeding actively in the newly discovered field at Roumaila, about 20 miles west of Zubair, where the first exploratory well struck oil in a formation similar to that of Zubair and at approxi-



Map of South Iraq showing fields, concessions and pipe lines.





mately the same depth. On June 1, 1954 the position of the succeeding wells was as follows:

No. 2	10,700 feet
No. 3	9,600 feet
No. 4	10,040 feet

A de-gassing station now under construction at Roumaila is scheduled for completion early in 1955, when it is expected that production from this field will commence.

While no official estimates of reserves for Iraq have been published, in a paper read by F. E. Willings, chief geologist to the Iraq Petroleum Co., at the summer meeting of the Institute of Petroleum in June 1953, a table was presented (based on information available at that date) which estimated crude reserves of Iraq at 1,600 million tons (about 12,000,000,000 barrels) and those of Qatar as 200 million tons (roundly 1,500,000,000 barrels).

Since these figures were given, a further field has been discovered at Roumaila, about 20 miles west of Zubair, by the Basrah Petroleum Co., in which development is rapidly proceeding as mentioned above but which is not yet in production, while extensions have been made to other fields. It is probable therefore that the above estimate, which was perhaps the nearest that could be made at the time, is below present actuality.

In appearance Kirkuk crude oil is reddish-brown, without bloom, and transparent only in thin section. The following table gives the characteristics of the crude as determined by I.P. standard methods.

Sp. gr. at 60°F		0.844
Distillation at	50°C	Trace
" "	75°C	4.5
" "	100°C	10.0
" "	125°C	15.0
" "	150°C	21.0
" "	175°C	26.5
" "	200°C	32.0
" "	225°C	38.5
" "	250°C	42.5
" "	275°C	46.5
" "	300°C	52.5
Sulfur percent wt.		2.0
Viscosity Redwood 1, sec:—		
	at 40°F	59.0
	at 70°F	44.5
	at 100°F	38.5
Hard asphalt, percent wt.		0.9
Flash-point, °F		Below 0°F
Pour-Point, °F		Below 0°F
Chloride content, percent wt.		0.001

Assessment of the above crude oil by means of the Hempel Distillation (U. S. Bureau of Mines Bulletin 207) is as follows:

Light gasoline, Vol. percent	11.3
Gasoline naphtha, Vol. percent	32.8
Kerosine distillate, Vol. percent	15.7
Gas-oil distillate, Vol. percent	14.0
Non-viscous lub. distillate, Vol. percent	9.9
Medium lub. distillate, Vol. percent	2.6
Residue, Vol. percent	23.8
Loss, Vol. percent	1.2

This oil is a mixed-base crude, predominantly paraffinic, and is classed as 'intermediate wax-bearing' by the U. S. Bureau of Mines method (11/1953).

The following is a typical analysis of the crude producing from the third pay zone of the Zubair field:

TABLE 1
Wells Completed in Producing Fields
(Cumulative 1927-1939 and annually from 1940-1953)

Company	I.P.C.	M.P.C.		B.P.C.	Q.P.C.	
Field	Kirkuk	Zalah	Butmah	Zubair	Dukhan	Total
1927-1939	52	1	..	..	..	53
1940	3	4	..	..	1	8
1941	..	2	..	..	1	3
1942	..	..	..	..	1	1
1943	..	..	..	..	..	..
1944	5	..	..	..	..	5
1945	7	..	..	..	..	7
1946	4	..	..	..	..	4
1947	8	..	..	..	..	8
1948	3	4	..	..	3	10
1949	8	3	..	1	6	18
1950	13	3	..	2	5	23
1951	7	2	..	9	7	25
1952	1	1	..	9	8	19
1953	3	1	1	11	6	22
Total	114	21	1	32	38	206
Producing wells at December 31, 1953	44	4	1	18	22	89

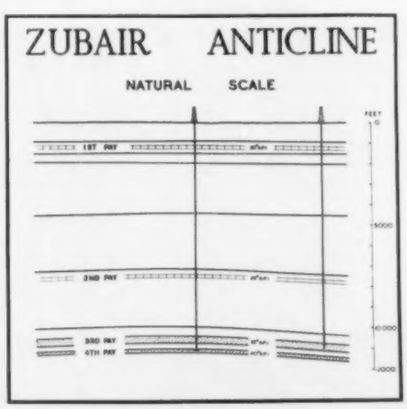
Sp Gr. at	60°F	0.8655
B.P.	50°C	—
	75°C	0.5
	100°C	3.0
	125°C	8.5
	150°C	14.5
	175°C	20.5
	200°C	25.5
	225°C	31.0
	250°C	36.0
	275°C	41.0
	300°C	46.0
Sulfur wt. percent		2.0
Asphaltenes wt. percent		1.1
H_2S		Nil
Viscosity Kinematic		
at	60°F	16.79 centistokes
	70°F	13.81
	80°F	11.17
	90°F	9.05
	100°F	7.69

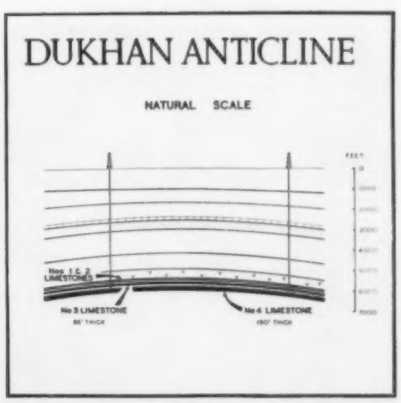
Oil produced at Qatar (Persian Gulf), where discovery was made in 1940 in the Zekrit limestone, is similar in nature to other Middle East crudes, being of intermediate type, predominantly paraffinic, and of high sulfur content. Typical analyses are as follows:

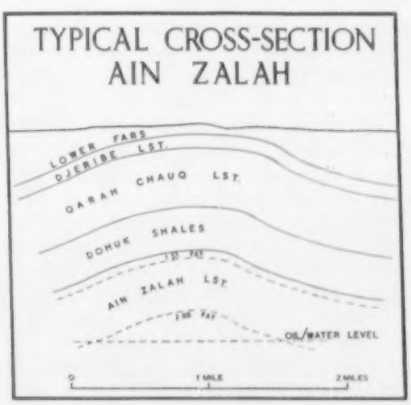
Spr. gr. at 60°F				0.854
Distillation at	75°C	Vol.	percent	1.5
" "	100°C	"	"	6.0
" "	125°C	"	"	11.5
" "	150°C	"	"	17.0
" "	175°C	"	"	22.5
" "	200°C	"	"	29.0
" "	225°C	"	"	35.0
" "	250°C	"	"	41.0
" "	275°C	"	"	46.0
" "	300°C	"	"	52.0
Sulfur content				1.90
Hempel distillation				
Gasoline naphtha Vol. percent				31.5
Kerosine distillate Vol. percent				10.0
Gas Oil distillate Vol. percent				17.0
Residue, Vol. percent				41.0
Loss, Vol. percent				0.5

All the producing fields of the Iraq Petroleum Co. Ltd. and its associates and located at considerable distances from seaboard, and therefore all oil for export has to be pumped from the source of production to a sea loading station.

The original Kirkuk field is some 550 miles from the Mediterranean and as soon as it became evident that production would be sufficient to justify a pipe line to the coast, plans for its building were drawn.







Baba Gurgur discovery well in Iraq which came in with an initial output of 60,000 b/d on October 14, 1927.

The Turkish Petroleum Co.'s concession of 1925 had called for the construction of a pipe line to the Mediterranean, and in case, an order had had to be placed for a pipe line within four years after testing of the plots selected for exploitation.

Surveys for the first pipe line were carried out in 1928-30, and in the autumn of 1930 it was decided to lay a double 12-inch line to the Mediterranean coast. Considerable discussion ensued as to the route to be followed and location of a western terminus. To reconcile conflicting views, it was decided to follow a common route from Kirkuk to Haditha on the river Euphrates, and there to bifurcate, with a northern line running through Syria and Lebanon to Tripoli and a southern line extending through Trans-Jordan and Palestine (now Israel) to Haifa.

Work was started on the project early in 1932 and laying of the lines commenced in August 1932. Construction of the northern leg to Tripoli was completed in July 1934. The southern line was completed in October 1934, the first oil reaching the Haifa terminal on October 14, exactly seven years after oil was first struck at Kirkuk in Baba Gurgur No. 1.

By the summer of 1939 at Kirkuk production had increased so much that a large increase in pipe line capacity was justified and plans were made for the laying of two 16-inch lines parallel to the existing 12-inch pipes. The outbreak of World War II caused a cessation of these plans which were not resumed until 1945, when pipe was ordered, and construction commenced in 1946.

The southern leg had reached within 50 miles of Haifa by the spring of 1948,

TABLE II

Production by Years and Fields Since Discovery (In Tons)

Company	I.P.C.	M.R.C.		B.P.C.	Q.P.C.
Field	Kirkuk	Ain Zalah	Butmah	Zubair	Dukhan
1927	80,952.0				
1928	39,249.0				
1929	31,819.0				
1930	41,035.0				
1931	32,556.0				
1932	15,761.0				
1933	43,039.0				
1934	967,021.33				
1935	3,581,953.73				
1936	3,914,212.97				
1937	4,139,481.43				
1938	4,162,939.04				
1939	3,810,975.5	2,106.0			4,143
1940	2,456,414.5	6,761.0			4,928
1941	1,426,015.0	4,888.5			752
1942	3,054,423.0	.....			....
1943	3,567,525.0	.....			....
1944	4,057,223.5	.....			....
1945	4,341,684.0	.....			....
1946	4,402,828.0	.....			....
1947	4,407,040.0	.....			8,618
1948	3,102,796.0	4,045.0		3,783	80,307
1949	3,802,981.0	8,126.5		4,010	1,616,598
1950	6,160,765.0	5,501.0		137,176.5	2,332,213.5
1951	7,987,024.42	7,232.5	853.5	2,238,177.0	3,245,343
1952	15,552,715.26	269,911.0	23,413.0	3,077,522.0	3,997,925.5
1953	22,865,537.88	1,253,725.5			
Total	108,045,965.56	1,562,279.0	24,266.5	5,460,668.5	11,290,828
Cumulative production for first six months of 1954—	11,545,313	644,895		2,044,538	2,265,229

TABLE III

Iraq Petroleum Company

Shipments from Tripoli/Banias, 1953 (Long Tons)

Destinations	Ex Tripoli	Ex Banias	Total I.P.C.
United Kingdom	2,186,195.45	2,894,040.27	5,080,235.72
France	1,674,400.28	6,528,739.89	8,203,140.17
Italy	1,184,252.71	3,628,407.12	4,812,659.83
Germany	81,099.30	1,370,209.89	1,451,309.19
Belgium	223,023.08	599,273.53	822,296.61
Holland	379,255.47	211,432.46	590,687.93
Trieste	59,109.97	225,692.89	284,802.86
Yugoslavia	42,598.62	367,153.28	409,751.90
Sweden	12,431.89	59,190.54	71,622.43
U.S.A.	25,638.81	85,487.56	111,126.27
Portugal		13,929.63	13,929.63
British West Indies		60,124.36	60,124.36
Spain		48,702.25	48,702.25
	5,868,005.58	16,092,383.57	21,960,389.15
Tripoli refinery	447,574.63		447,574.63
	6,315,580.21	16,092,383.57	22,407,963.78

Mosul Petroleum Company

Shipments from Tripoli/Banias, 1953

Destination	Long Tons
United Kingdom	433,048.45
France	334,514.71
Italy	231,671.38
Germany	16,100.70
Belgium	44,276.92
Holland	74,056.10
Trieste	11,462.41
Yugoslavia	9,226.99
Sweden	2,468.11
U.S.A.	5,649.23
	1,162,475.00
Tripoli refinery	88,322.17
	1,250,797.17

Basrah Petroleum Company

Shipments from Fao, 1953

Destination	Long Tons
United Kingdom	666,274.50
France	678,527.50
Italy	425,491.50
Holland	276,156.00
Sweden	57,505.00
U.S.A.	67,209.50
Portugal	66,464.50
Japan	34,366.00
Sumatra	247,550.50
Borneo	343,318.00
	2,862,863.00

but owing to disturbed conditions in Israel, the work was stopped and operations on the southern 12-inch line were also suspended. Up to the present time no resumption of operations has taken place.

The construction of the 16-inch line to Tripoli was continued and delivery of crude oil through it commenced in July 1949, full capacity being reached in 1950. The delivery capacity of the double line to Tripoli is about 150,000 barrels daily.

The increasing potential of the Kirkuk field and the rapidly expanding demand for Middle East oil necessitated the provision of more pipe line capacity and the building of a 30-32-inch line from Kirkuk to Banias, Lebanon, was decided upon.

It was first planned in 1947, but owing to shortage of steel and construction equipment, it was not possible to commence the laying until September 1950. By April 1952, oil was being pumped through the new line, which was officially opened by King Faisal II of Iraq on November 18, 1952. The total length of this line is 556 miles, its cost £43,000,000 ($120 million) and its capacity 300,000 b/d.

At the Banias terminal six large tankers can load simultaneously at the sea loading berths, while at the Tripoli terminal there are four berths where loading can take place under similar conditions.

The oil produced by Basrah Petroleum Co. is delivered by two pipe lines to the ocean terminal of Fao on the Persian Gulf. One line is of 12 inch diameter about 70 miles long and is laid on concrete piles passing along the edge of marshy ground close to the road to permit access to it during the rainy season. It is not wrapped and is protected against corrosion by bitumastic paint. It was completed in the early part of 1952. The other line is of 24 inch diameter and is buried across the marshy ground. Although the ground through which it passes is corrosive, yet it is felt that in view of the company's experience in this work, it can be safely protected against corrosion cathodically and by wrapping. It was laid during the dry season of 1953.

At the Fao terminal three loading jetties have been erected and a fourth is in course of erection, all of which will accommodate the largest size tankers.

The crude produced by Qatar Petroleum Co. is dispatched from the field at Dukhan by a 12-14-inch pipe line, 73 miles long, to the ocean terminal at Umm Said on the west coast of the peninsula, where there is sufficient depth of water for supertankers to be loaded.

There are two loading berths with a 24-inch line running out to each; at the end, each line is bifurcated into two 10-inch flexible hoses.

Drilling during 1953 included: Iraq Petroleum Co., Kirkuk, about 15,000 feet; 21,525 for Mosul Petroleum Co. at Ain Zalah and Butmah; and 12,742 for Basrah Petroleum Co. at Zubair and Rumaila.

These figures emphasize the differences in drilling required in Kirkuk, an established field, with a production of 22,865,538 tons and the Mosul and Basrah fields which are in course of development.

The most important discovery at Kirkuk during the year was that of the Bai Hassan well, close to the Lesser Zab. Exploration work and drilling were undertaken on neighboring structures at Kor Mor and Jambur, and at Palkhanah and Chemchemal. At Ain Zalah four productive wells were drilled during the year and at Butmah the discovery well was brought in which has now been succeeded by a No. 2 well on that field.

The Basrah Petroleum Co. drilled 12 productive wells during the year, including the one at Rumaila. Five wells were successfully drilled in the lake area, this being the first time that underwater drilling has been undertaken in Iraq.

An oil property that falls in a special class is that of Khanaquin Oil Co. Ltd., formerly owned by Anglo-Iranian, but now an Iraqui company. Its crude is derived from the Naft Kahna field, part of which lies in Iraq territory and part in Persian. Production on the Iraq side is running at 12,000 b/d and is processed in the refinery of the Khanaquin Oil Co. at El Ahwand.

An additional well is being drilled in this field to test horizons below the present producing horizon, and is now down to about 7,000 feet. Another exploratory well is being sunk at Chia Surkh, in the same district which D'Arcy explored before getting production in Persia. At the end of July 1954, this well was drilling at a depth of about 11,000 feet.

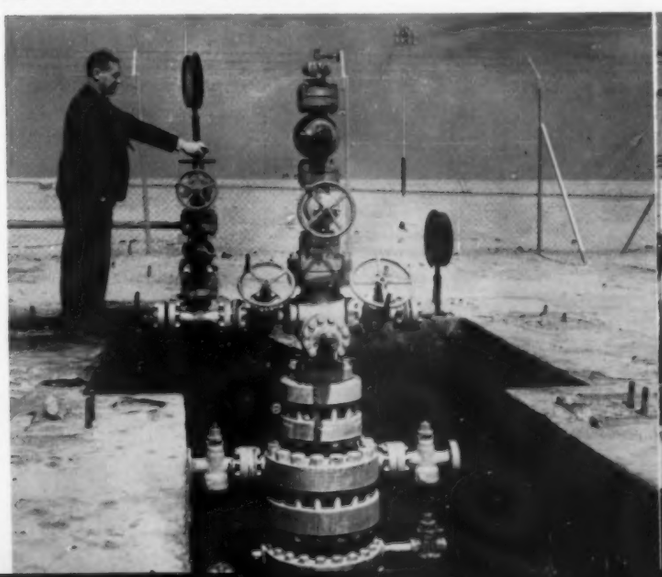
Public and social services have always been among the activities fostered by the Iraq Petroleum Co., both for the benefit of its own employees and those of the local inhabitants and tribesmen, and these have been carried out in conjunction with the government and with its full approval.

With the ratification of the 1952 agreement between the government and the company, it was planned to extend these activities considerably further. The government announced that out of the revenue accruing to it from the oil companies, it had decided to set aside 70 percent for the projects of the Iraq Development Board, including flood control and irrigation schemes, schools, hospitals and other amenities which will raise the standard of living of the Iraqi people.

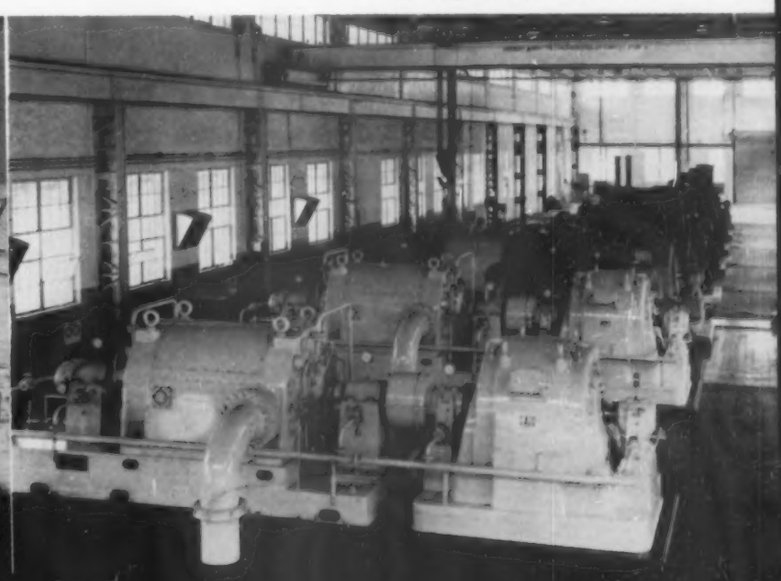
In 1953 the production of crude by the Iraq Petroleum Co., Mosul Petroleum Co., and Basrah Petroleum Co. amounted to just over 27,200,000 tons, and from this production the revenues received by the government amounted to £51,400,000; on these figures a sum of approximately £36 million became available for the development board's activities, which are being pushed ahead rapidly. In the not too distant future, one may expect, therefore, that Iraq will again become a prosperous agricultural country, even though these flood control and irrigation schemes have suffered considerably owing to the disastrous floods in the early part of this year.

All IPC companies which have developed production in the Middle East have interested themselves in improving the housing, medical attention and education of employees and their families. Wherever oil is produced the standard of living has risen.

Christmas tree at Zubair No 30 wellhead. Basrah Petroleum Company's 1953 production from eighteen wells totalled 3,077,522 tons.



Pumps for the 12 and 16-inch lines in the Kirkuk generator house of Iraq Petroleum Co. Ltd.



SAUDI ARABIA -

oil empire of the East

IN THE SIXTEEN YEARS which have elapsed since oil was discovered in Saudi Arabia, the nation has become one of the great oil producing countries of the world, with an industry investment of $650 million and potential reserves of the first order. For the past two and a half years, output of the four active fields has been at an annual rate in excess of 300 million barrels. Known reserves have been variously calculated up to thirty billion barrels and potential reserves at far greater figures.

The nation is a prime example of the impact which development of a rich natural resource has on the economy of a country. In a few short years housing, health, education and other standards of living have advanced from a medieval to a modern level. Scientific agriculture has been undertaken under expert guidance. A modern diesel powered railroad has been built from tidewater to the capital city of Riyadh and eventually will cross the peninsula to link the Red Sea with the Persian Gulf. Hard surfaced roads are pushing outward into the desert. Schools and hospitals are being built. Budget of the government has grown from $6 million to $65 million in the first ten years after oil was found.

It is generally considered that the standard of living of a nation in the middle of the 20th century can be indicated with great accuracy by the volume of petroleum consumed by its citizens. Assuming this to be true, it appears that the Saudi Arabian standard of living has advanced at a terrific pace in recent years. In 1948 the consumption of petroleum and its products was 387,353 barrels, an average of 0.07 barrels per capita. Five years later in 1953, consumption had increased 250 percent to 1,466,627 barrels, an average of 0.3 barrels per capita.

Modern Saudi Arabia came to maturity as a nation under the leadership of the late Ibn Saud, who died on November 9, 1953. King Ibn Saud began his conquest of Arabia in 1902 when he and his followers captured the city of Riyadh. From this strongpoint, Ibn Saud expanded his rule through central Arabia and in 1913 absorbed the province of Al Hasa into his growing kingdom. It was this area which 20 years later was to be the scene of oil development by Arabian American Oil Co. The drive to unite Arabia came to a successful conclusion in 1925 when Saud captured the city of Jiddah on the shores of the Red Sea.

In his 25-year struggle for leadership Ibn Saud ejected foreign powers that sought to intervene in Arabian affairs. He united his followers under a rule which was inherently a religious movement, a Moslem sect which kept close to the Koran as taught 200 years previously by the religious teacher Abdul Wakhab.

The first break in the wall of isolationism came after Standard Oil Co. of California began developing its concession on Bahrain Island a few miles off the coast. The Shaikh of Bahrain is said to have told his good friend the King of Saudi Arabia that the Americans were not attempting to interfere in politics and that the oil development was bringing employment and prosperity to his people. Ibn Saud is said to have remarked that he granted the oil concession to Americans because "they are so far away."

Negotiations by Standard of California for the Aramco concession were begun at Jiddah in 1933. It is here that thousands of Moslem pilgrims to Mecca land each year.

Fees collected from the pilgrims constituted at that time the bulk of the government's income. Today, thanks to oil, the pilgrims are not taxed.

The 1933 negotiators were 10 years ahead of official American diplomatic representation in Arabia. It was not until 1943 that the United States Minister to Egypt was accredited to Saudi Arabia. At the close of the negotiations on May 29, 1933, a concession was granted covering 320,000 square miles in the eastern half of the country. The concession was for 60 years beginning on July 14, 1933. Since that time the original concession has been expanded to cover 440,000 square miles.

The first geologists to enter Saudi Arabia for oil reconnaissance dressed themselves in the flowing robes of the Arabs, grew beards to minimize their foreign appearance and lived in tents. Few of the Arabs in the area bordering on the Persian Gulf had ever before seen a foreigner.

It took five years and $10 million to find commercial production in Saudi Arabia after the geologists landed at Jubail. Two years were consumed in geological investigations before the first wildcat was spudded. The 1935 test was drilled on the Dammam structure which probably lies over a deep-seated salt dome. It is a structure similar to that which was producing in Bahrain. The well found oil at the same depth as on the island, but not in commercial quantities. Ten wells were drilled in the next two and a half years without success. Finally, in March 1938, Well No. 7 was deepened to the Jurassic and the Dammam field was discovered. Commercial production was begun the following October when the first barge load of oil was ferried to Bahrain Island.

In 1936, during the early phases of exploration, The Texas Company obtained a half interest in the Arabian operations and the work was carried forward for the next ten years by the two companies, first as California Arabian Standard Oil Company and after 1944 as Arabian American Oil Company or "Aramco."

In May 1939 shipment of the first tanker-load of Saudi Arabian oil was celebrated by the first visit of King Ibn Saud to Aramco's scene of operations. On that occasion 400 automobiles brought the royal party to the Gulf; this was almost the entire automotive fleet of the nation at that time. Today it is estimated that there are 20,000 motor vehicles in Saudi Arabia.

Four months after commercial production began, World War II broke out with disastrous results to the promising young enterprise. Shipments of equipment were halted by the conflict and even food was scarce. Operations were continued for a time with available supplies. In 1940 two wildcats were dry, but two others were successful. The Abu Hadriya field was discovered in March and the prolific Abqaiq field in November. A small topping plant was placed in operation that year to supply local domestic demand for petroleum products. Capacity was 3,000 b/d.

As General Rommel's panzer army swept westward across north Africa, the flow of supplies for Arabian development dried up. Italian planes bombed the installations with the result that wives and children were sent home and preparations made to plug wells and retreat by caravan across the peninsula to Aden for evacuation. By 1942 the American staff had been reduced from 400 to 82.

With the change in the tide of war in 1943, the importance of an oil supply in the Middle East was recognized by the military and top priority was granted for the construction of a 50,000 b/d $50 million refinery at Ras Tanura. This privately-financed plant was completed early in 1945.

Throughout the war period prior to the building of the Ras Tanura plant, crude production had averaged about 12,000 b/d. With the refinery open, Aramco increased production to 58,000 b/d in 1944 and 164,000 b/d in 1946. Since that time output has risen steadily, as shown in Table I.

In 1946 Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc., began negotiations to participate in Aramco when the operation threatened to become too big an undertaking from a capital risk standpoint for the original two companies. Very large investment in producing and refining equipment was required for development and it appeared necessary to undertake the construction of a big-inch line across Arabia to the Mediterranean to facilitate movement of crude to growing European markets.

Negotiations were complicated by the Red Line Agreement of 1928 under which participants in Iraq Petroleum Co. undertook not to enter any part of the old Turkish Empire as operators without participation or acquiesence of other IPC member companies. It was not until a year later that all objections were overcome and Jersey and Socony invested $125 million in the operation. After that date, Texaco, California Standard and Jersey Standard each had a 30 percent interest and Socony a 10 percent interest in Aramco.

Exploration and step-out drilling ac-

TABLE I
Annual Gross Production of Crude Oil

Years	Barrels	Years	Barrels
1938*	495,135	1946	59,943,766
1939	3,933,903	1947	89,851,646
1940	5,074,838	1948	142,842,989
1941	4,310,110	1949	174,008,629
1942	4,530,492	1950	199,546,638
1943	4,868,184	1951	277,962,605
1944	7,794,420	1952	301,860,885
1945	21,310,996	1953	308,294,245

*Commercial production declared October 16, 1938.

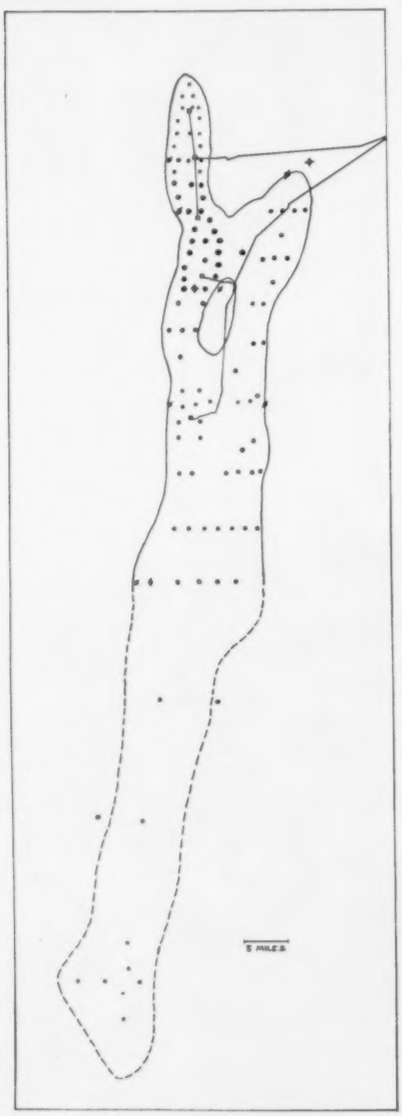
Aerial view of the Arabian American Oil Company's refinery at Ras Tanura, Saudi Arabia, which has a crude capacity of 189,000 b/d.

Closeup view of part of Aramco's Ras Tanura refinery.

tivity has been steady in the post-war period. Wildcatting has been rewarded by the discovery of a number of new fields or indicated fields. Qatif was discovered in 1945, Ain Dar in 1948, Fadhili and Haradh in 1949, the offshore Safaniya field in northern Saudi Arabia and Uthmaniyah in 1951, Shedgum in 1953 and Huiya in December 1953.

Step-out drilling in the general Ghawar field area has indicated connections between the Ain Dar, Shedgum and Uthmaniyah, Huiya and Haradh areas. The Ghawar field now is about 130 miles long and 12 miles wide.

Well locations in Aramco's Ghawar field, Saudi Arabia.



In 1953 Aramco drilled 27 wells in the Ghawar field, of which nine were in the Shedgum area, two in Ain Dar, one at Huiya and 15 in the Uthmaniyah area.

During the past three years drilling has been concentrated in the Ghawar area and at Safaniya. No wells have been completed at Qatif and Dammam since August 1950 or since December 1950 at Ain Dar.

Aramco's plan has been to attempt outlining major fields by drilling step-outs along the main axis of the anticlinal ridges. Following the discovery of Ain Dar in 1948 a series of 3½ mile step-outs was drilled along the axis with occasional widely spaced profile wells designed to indicate the lateral width of the field. Profile wells were drilled 6,000 to 9,000 feet from the axis. These were followed by an observation well to test the oil-water contact. The first eight wells drilled in the field proved a producing area 14 miles long and some five miles wide.

At the end of 1950 there were eight wells in the field and it still was undefined to the south. In January 1951 a well was spudded in the Uthmaniyah area 41 miles south of the original Ain Dar well. When this came in as a successful well the step-out pattern became even greater. A third well was drilled 10 miles to the north between the two areas. In giant steps the intervening space was drilled in an effort to determine whether the two fields were one. While this drilling was progressing, a new find was made east of Ain Dar in the Shedgum area and this too has been proven to be a part of what is now known as the Ghawar field.

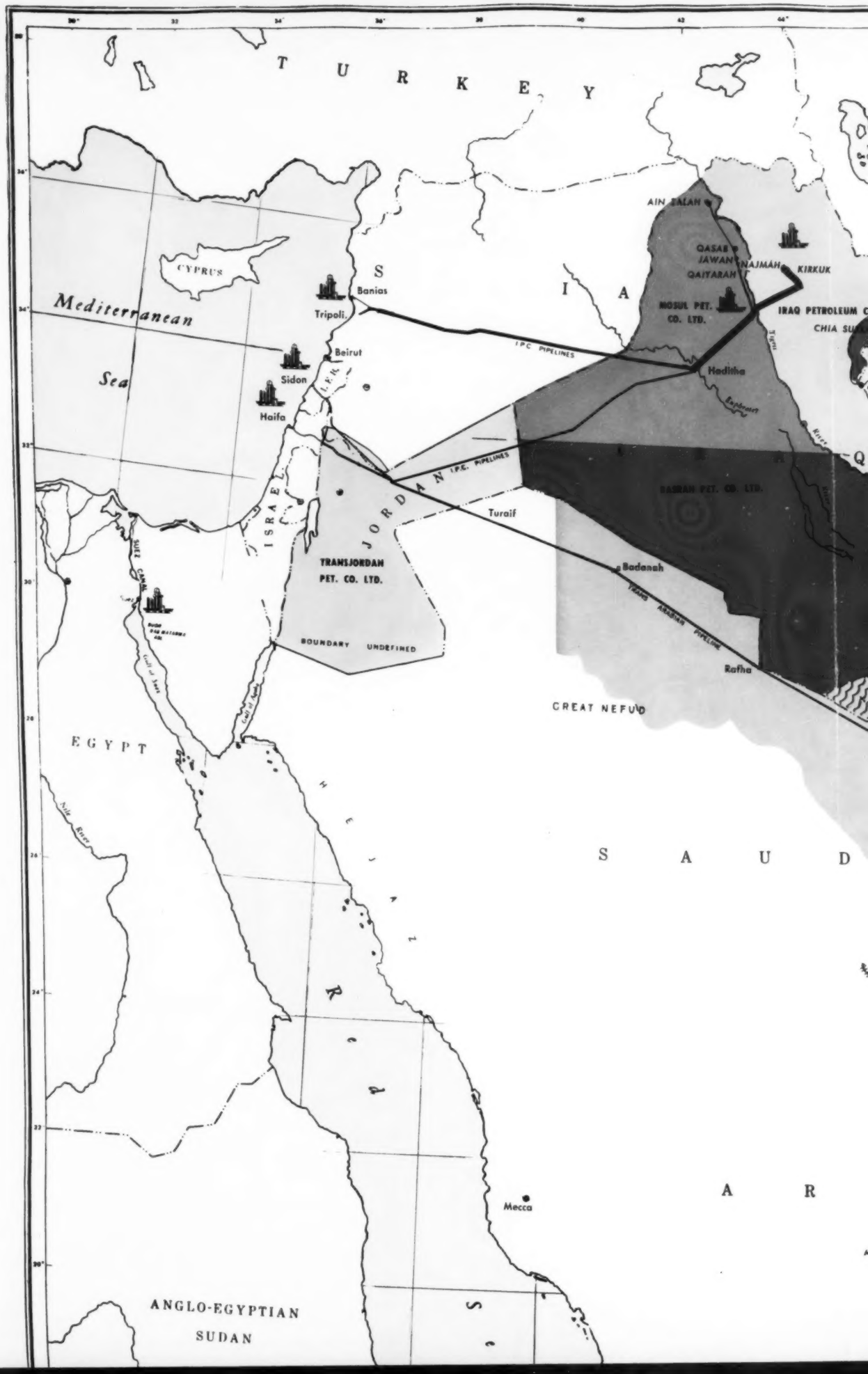
In December 1953 Aramco drilled what was another giant step-out to the south of Ghawar. Production was found in the Huiya area 15 miles to the south.

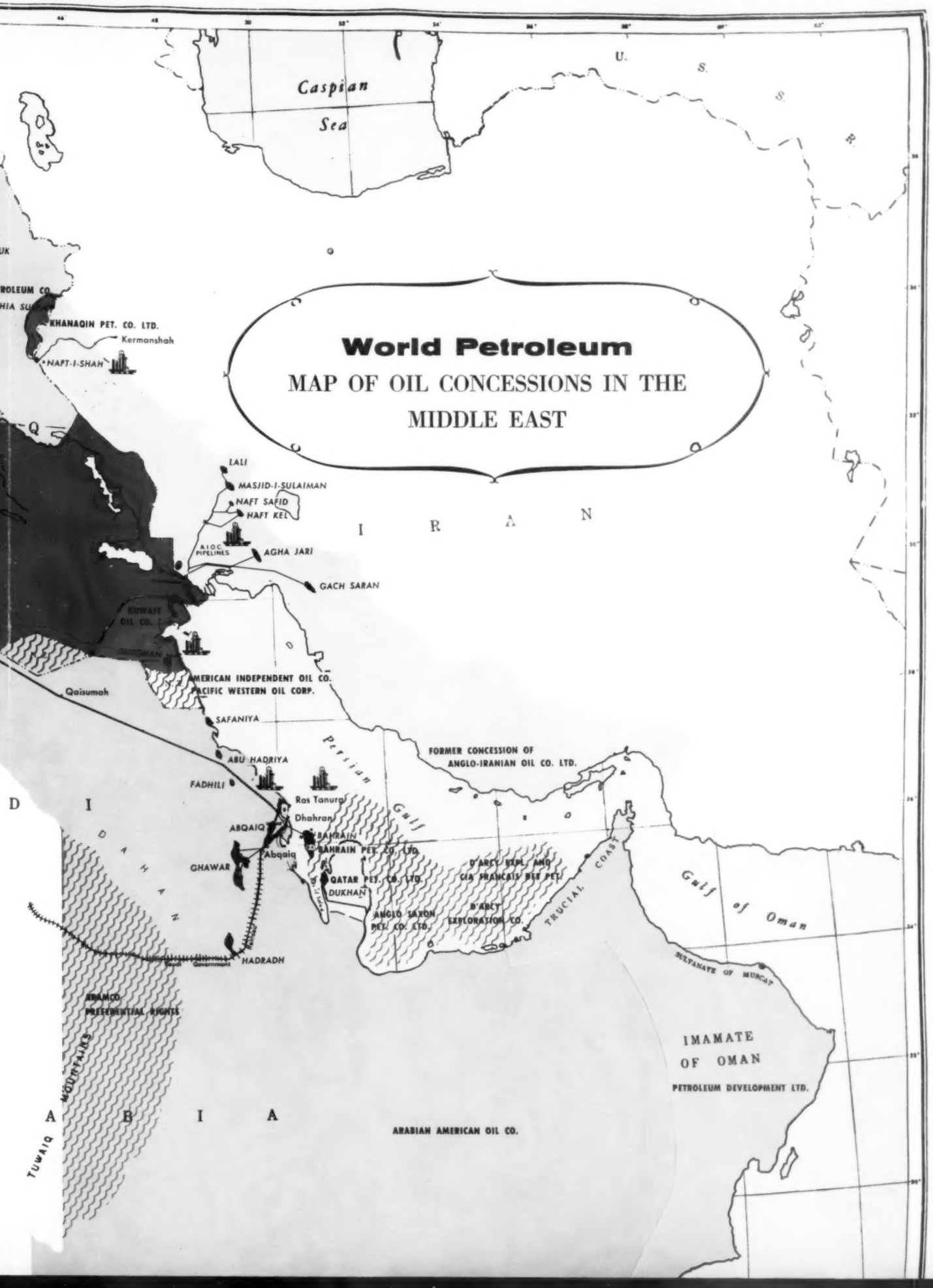
On June 30 of this year four Saudi Arabian fields were producing and three were shut in. Status of wells in the various fields is shown in Table II.

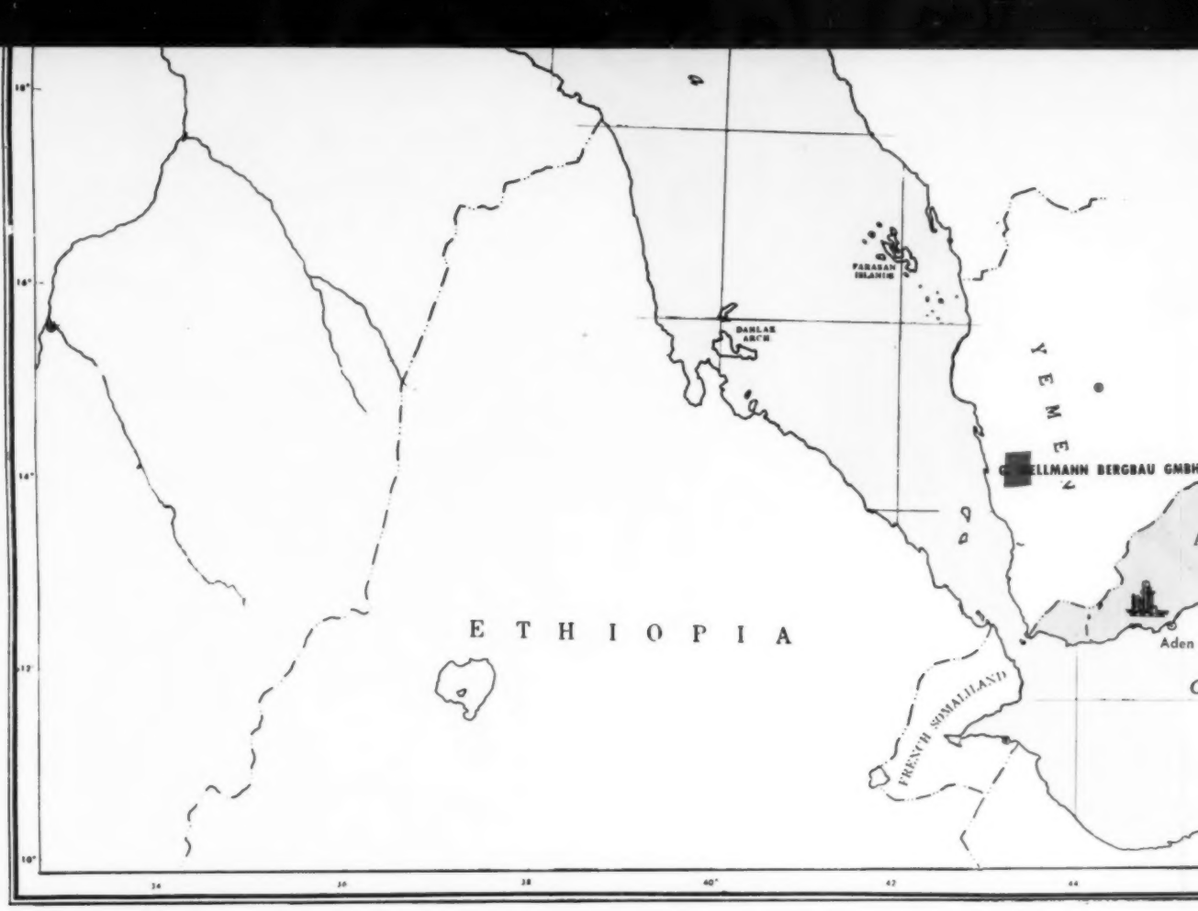
Aramco has been diligent in studying its Saudi Arabian fields to maintain optimum rates of production for maximum ultimate recovery. Eleven observation wells in the various fields are watched continuously by the reservoir engineering staff. At Dhahran a new oil operations laboratory has been completed.

In 1951 work was begun on a $19 million pressure maintenance plant at Abqaiq. Last year it was noted that gas/oil ratios in certain wells in this field were rising unduly. As a result, eight Abqaiq wells were shut in. The pressure maintenance plant has a capacity of 150 million cubic feet of gas per day. Gas is collected from the three gas oil separator plants by a 20-24-inch line to a compressor plant near the main stabilization units.

Compressor equipment includes four 2,500 hp steam-driven centrifugals operating at 9,000 rpm in two stages and four electric motor-driven 2,500 hp reciprocating high-stage compressors operating at 300 rpm. Reciprocating compressor discharge pressure is 2,500 psi. Compressed gas will be stripped of liquids and water vapor in a series of ten columns before injection in two wells near the Abqaiq main camp at the south end of the field where there is a closure of about 1,500


T U R K E Y
CYPRUS
Mediterranean Sea
Banias
Tripoli
Beirut
Sidon
Haifa
I.P.C. PIPELINES
AIN TALAH
QASAB
JAWAN
QAITARAH
NAJMAH
KIRKUK
MOSUL PET. CO. LTD.
IRAQ PETROLEUM CO.
CHIA SURKH
Hadithe
Euphrates
Tigris
BAHRAN PET. CO. LTD.
Turaif
ISRAEL
JORDAN
TRANSJORDAN PET. CO. LTD.
BOUNDARY UNDEFINED
Badanah
TRANS ARABIAN PIPELINE
Rafha
GREAT NEFUD
SUEZ CANAL
Gulf of Suez
EGYPT
Nile River
Mecca
ANGLO-EGYPTIAN SUDAN
S A U D
A R


World Petroleum
MAP OF OIL CONCESSIONS IN THE MIDDLE EAST
Caspian Sea
U. S. S. R.
KHANAQIN PET. CO. LTD.
Kermanshah
NAFT-I-SHAH
LALI
MASJID-I-SULAIMAN
NAFT SAFID
HAFT KEL
I R A N
A.I.O.C. PIPELINES
AGHA JARI
GACH SARAN
KUWAIT OIL CO.
AMERICAN INDEPENDENT OIL CO.
PACIFIC WESTERN OIL CORP.
Qaisumah
SAFANIYA
ABU HADRIYA
FADHILI
Ras Tanura
Dhahran
ABQAIQ
Abqaiq
BAHRAIN
BAHRAIN PET. CO. LTD.
GHAWAR
QATAR PET. CO. LTD.
DUKHAN
FORMER CONCESSION OF ANGLO-IRANIAN OIL CO. LTD.
Persian Gulf
D'ARCY EXPL. AND CIA FRANCAIS DES PET.
ANGLO SAXON PET. CO. LTD.
D'ARCY EXPLORATION CO.
TRUCIAL COAST
Gulf of Oman
SULTANATE OF MUSCAT
HADRADH
ARAMCO PREFERENTIAL RIGHTS
IMAMATE OF OMAN
PETROLEUM DEVELOPMENT LTD.
A B I A
ARABIAN AMERICAN OIL CO.
TUWAIQ MOUNTAINS



MIDDLE AND NEAR EAST OIL CO

ADEN

Petroleum Concessions Ltd.
Subsidiary of Iraq Petroleum Co. Ltd.
Exploration permit covers entire nation, about 112,000 square miles.

BAHRAIN ISLAND

Bahrain Petroleum Co. Ltd.
Company owned equally by The Texas Co. and Standard Oil Co. of California.
Concession covers all Bahrain and territorial waters, area about 1,700 square miles.
Expires 2024.

DHOFAR

Dhofar-Cities Service Petroleum Corp.
Subsidiary of Cities Service Oil Co.
Concession covers entire country, about 30,000 square miles.

HADHRAMAUT

Petroleum Concessions Ltd.
Subsidiary of Iraq Petroleum Co. Ltd.
Exploration permit covers entire nation, about 65,000 square miles.

JORDAN

Transjordan Petroleum Co. Ltd.
Subsidiary of Petroleum Concessions Ltd. (IPC)
Inactive concession covers entire country, about 8,000 square miles.

KUWAIT

Kuwait Oil Co. Ltd.
Subsidiary of D'Arcy Kuwait Co. Ltd. (Anglo-Iranian) and Gulf Kuwait Co. (Gulf Oil Corp.).
Covers all of Kuwait and territorial waters, about 6,000 square miles.

IRAQ

Basrah Petroleum Co. Ltd.
Subsidiary of Iraq Petroleum Co.
Concession covers southern part of Iraq—all territory not covered by IPC, Mosul and Khanaqin concessions.

Iraq Petroleum Co. Ltd.
Concession covers provinces of Baghdad and Mosul (east of Tigris River—except Khanaqin concession), about 32,000 square miles. Expires 2000.
Ownership: Anglo-Saxon Petroleum Co. Ltd. (Shell) 23.75%
D'Arcy Exploration Co. (Anglo-Iranian) 23.75%
Cie. Francaise des Petroles (French Gov't) 23.75%
Near East Development Corp. (Standard of N.J. and Socony-Vacuum) 23.75%
Participations and Investments Ltd. (C. I. Gulbenkian) 5.00%

IRAQ (Continued)

Khanaqin Petroleum Co. Ltd.
Subsidiary of Anglo-Iranian Oi
Concession covers extreme east

Mosul Petroleum Co. Ltd.
Subsidiary of Iraq Petroleum C
Concession covers all Iraq W
approximately 40,000 squa
Expires 2007.

ISRAEL

Israel has granted 38 explora
and companies covering abou
Lapidoth Israel
Israel Continental Oil C
Mediterranean Petrole
Pan Israel Oil Co., Inc.
Israel Continental Oil C
Husky Oil Co.
Nadel B. Gussman and
D. C. Bintliffi

IRAN

Former concession of Anglo-I
August 1954 with three 5-yea
consortium of British, Dutch, Fr
British .....
Dutch .....
French .....
American .....

Area of operations 100,000 sq

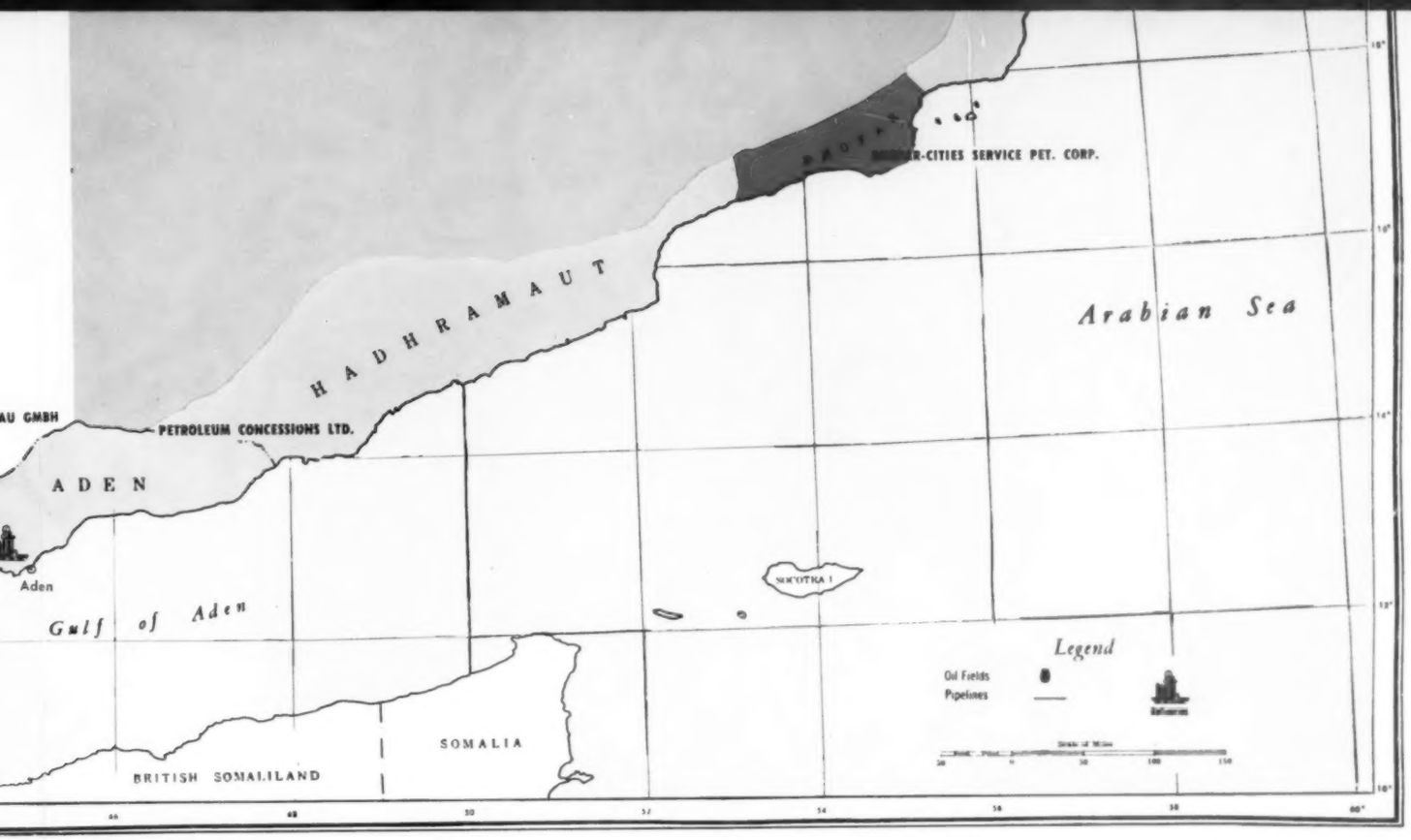
MUSCAT

Petroleum Development Co. Lt

NEUTRAL ZONE

American Independent Oil Co.
Ownership: Phillips Petroleum
Oil and Refining Co.; Ralph
Rock Oil Corp.; Globe Oil
Concession covers all of the
torial waters, about 1,190 s
Expires 2008.

Pacific Western Oil Corp.
Concession covers all of King
Expires 2008.



CONCESSION OWNERSHIP — EAST OF SUEZ

Ltd.
ian Oil Co. Ltd.
me east area adjacent to Iranian border.

eum Co. Ltd.
Iraq West of the Tigris River and north of 33° Latitude,
0 square miles.

xploration licenses (as of August 1954) to eight individuals
g about 2,500,000 acres. Companies are:

al Oil Co. Ltd.
Petroleum Corp. (three 100%; four 50%)
o., Inc. (three 100%; four 50%)
al Oil Co. Ltd.

an and Palestine Economic Corp.

Anglo-Iranian Oil Co. is to be operated for 25 years from
e 5-year extensions by two companies to be organized by a
utch, French and American interests.
.... 40% (Anglo-Iranian Oil Co.)
.... 14% (Royal Dutch/Shell Group)
.... 6% (Cie. Francaise des Petroles)
.... 40% (Standard Oil Co. N.J.; Socony Vacuum Oil Co.; Gulf Oil Corp.; Standard Oil Co. Calif.; The Texas Co.)
,000 square miles.

t Co. Ltd. (IPC)

Oil Co.
roleum Co.; Hancock Oil Co.; Signal Oil and Gas Co.; Ashland
; Ralph K. Davies; J. S. Abercrombie; Sunray Oil Corp.; Deep
be Oil and Refining Co.; Lario Oil and Gas Co.
of the Shaikh of Kuwait's interest in Neutral Zone and terri-
1,190 square miles.

p.
f King of Saudi Arabia's interests in Neutral Zone.

OMAN

Petroleum Development Co. Ltd. (IPC)

QATAR

Qatar Petroleum Co. Ltd.
Subsidiary of Iraq Petroleum Co. (IPC)
Concession covers all of Qatar, about 4,100 square miles.
Expires 2010.

QATAR (Continental Shelf)

Anglo Saxon Petroleum Co. Ltd. (Shell)
Concession covers continental shelf offshore from Qatar beyond 3-mile limit, about 10,200 square miles.
Expires 2127.

SAUDI ARABIA

Arabian American Oil Co.
Ownership: Standard Oil of Calif., 30%; The Texas Co., 30%; Standard Oil Co. (N.J.), 30%; Socony-Vacuum Oil Co. Inc., 10%.
Original concession covers approximately 440,000 square miles in eastern Saudi Arabia.
Preferential rights granted in central part of country.
Original concession expires 1999. Additional area including continental shelf offshore in Persian Gulf expires 2005.

TRUCIAL COAST

Petroleum Development Ltd.
Subsidiary of Petroleum Concessions Ltd. (IPC)
Concession covers onshore and lands of a group of small shaikhdoms, about 6,000 square miles.

TRUCIAL COAST (Marine)

D'Arcy Exploration Co.
Subsidiary of Anglo-Iranian Oil Co.
Concession covers continental shelf in Persian Gulf beyond 3-mile limit offshore from Abu Dhabi, area about 12,000 square miles.

D'Arcy Exploration Co. and Cie. Francaise des Petroles (French Gov't).
Concession covers continental shelf in Persian Gulf beyond 3-mile limit offshore from Dubai, area about 1,200 square miles.

YEMEN

G. Dellmann Bergbau GbmH.
Exploratory concession covers five square miles.
Expires 1958.

Additional copies of this map are available at $2.00 each. Send orders to WORLD PETROLEUM, 604 5th Ave., New York, 20, New York, U.S.A. Printed in Canada.

feet at the top of the D horizon of the Arab zone.

The Abqaiq field is about 32 miles long and six miles wide. It contains 66 wells of which 62 have been producing about 300,000 b/d during the past year. Prior to the development of the Ghawar field, Abqaiq was producing about 500,000 b/d, roughly two thirds of the Saudi Arabian output. Wells in Abqaiq are roughly 6,600 feet deep. Recoverable reserves have been estimated by some at around six billion barrels. This is not an official Aramco estimate.

Unlike Dammam, where first discovery was made in Saudi Arabia, surface geology of the Abqaiq field is obscured by wind-blown sand. The field was located by structure drilling to the base of the Eocene. Production is obtained from upper Jurassic oolitic and dolomitic limestones generally referred to as the Arab zone. Usually there are four groups separated by anhydrites. In Abqaiq the two upper members are water bearing and the fourth is the principal producer.

The first field to be found, as mentioned previously, was Dammam, a nearly circular dome about three by three and three quarters miles in diameter. The dome is clearly indicated by a surface structure rising above the coastal plain. Top of the Arab zone is encountered at about 4,500 feet. The field produces about 55,000 barrels daily.

Structure drilling also was responsible for discovery of the Qatif field in the Arab C and D zones topped at about 7,000 feet. There are nine producing wells in the field. Output is about 30,000 b/d.

Only Cretaceous production thus far found in Saudi Arabia is at Safaniya, where a discovery well was drilled about 2½ miles offshore in the Persian Gulf in August 1951. Since that time 15 wells have been drilled, but commercial production has not been undertaken. The field is about 20 miles south of the Kuwait Neutral Zone border and about 270 miles north of the Haradh field, the most southerly production yet found. The producing sand was topped at about 5,000 feet.

Preliminary geological and geophysical work at Safaniya was begun in 1949. Gravimetric studies, marine seismograph surveys and detailed core drilling work were done. The No. 1 well was drilled 12,000 feet offshore from a three level

Saudi Arabia's Dammam oil port is working constantly at full capacity from this two-ship deep water pier.

View from the cargo unloading tower on the end of the Dammam pier shows a flatcar heading toward the pier's end. The trestle extends almost seven miles out into the deep water of the Persian Gulf.

Aramco's offshore drilling rig at Safaniyah. Crew member of launch looks back toward drilling rig as launch speeds shoreward.

Shedgum No. 5, one of Aramco's most recent wells, is located on a plateau, the approach to which is through this rugged escarpment.

platform. Lowest level was 25 feet above water, the next 40 feet and the top deck 53 feet. For the second well and succeeding offshore locations, Aramco used a diesel-electric barge which first was used by Creole Petroleum Corp. in Venezuela and was towed 11,000 miles to the Persian Gulf.

Farther south than Safaniya, Cretaceous horizons have been largely eroded. Production is from the Cretaceous on Bahrain Island and in the Burgan field in Kuwait. Oil from the three fields is similar in character.

The producing sand at Safaniya and the oolites in other Saudi Arabian fields are definitely porous, thus making it possible to employ wide well spacing patterns. The take from each well is high, the average in Saudi Arabia currently being about 6,800 barrels per well per day. In terms of barrels per acre of field, the volume is not much greater than has been taken from prolific fields in the United States. Recently the take from Abqaiq was about six barrels per acre per day.

Geological and geophysical survey work is being continued in several parts of Saudi Arabia. In 1953 surface mapping work was in progress in the northwest and seismograph surveys in the gravel plains and the Jafura. Structure drilling was in progress in the Summan, the Dahana and the Rub al Khali. In the latter region gravimetric and magnetic surveys also were in progress.

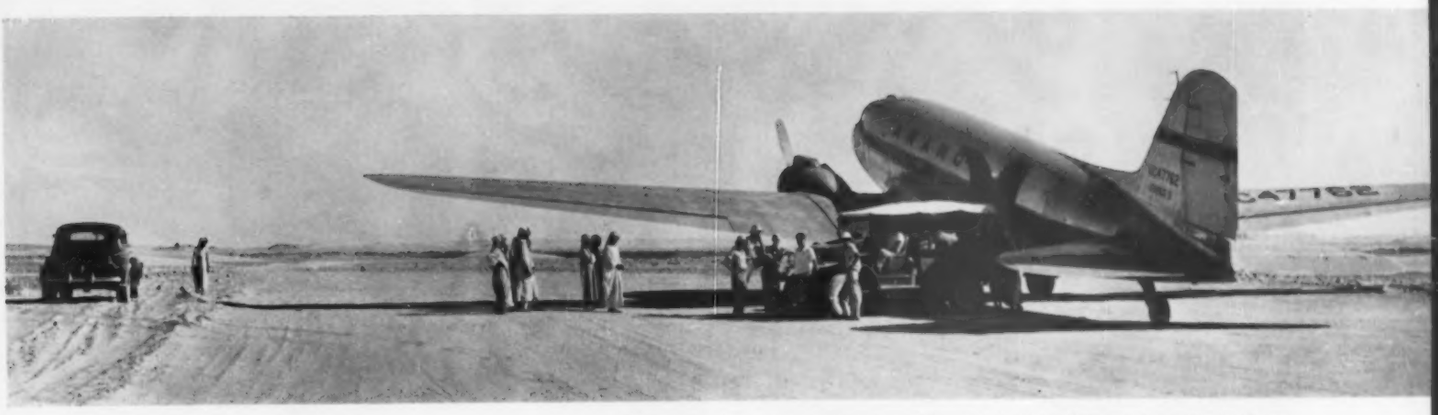
Crude oils from the most prolific zone, the Arab D, range in gravity from 35 to 37°API. Pour point is —5 to —15°F and wax content 2.0 to 3.8 percent. Sulfur content is 1.3 to 1.6 percent. This is lower than that generally observed in the "C" member of the Arab. Gasoline yield of 390°F e.p. by straight distillation ranges from 30.8 to 34.5 percent, kerosine from 8.7 to 10.8 percent, gas oil yield is 38 to 42 percent and residuum about 27 percent.

Octane value of straight run gasoline is not high, but reforming is effective in improving the quality. Middle distillates are a good source of high quality diesel fuel with cetane numbers as high as 58-60. The stock cracks readily.

Development of the oil industry in Saudi Arabia creates a tremendous demand for equipment and supplies. In the past three years, Aramco has spent $174 million in the United States, $57.5 million in Europe, $6.1 million in Australia and New Zealand and $45 million in other areas for equipment and supplies.

As mentioned previously, Aramco spent five years and $10 million before oil was discovered. Since that time the company has poured another $600 million into the properties, including $160 million into Tapline, $50 million into the gathering system and an estimated $60 million into the Ras Tanura refinery.

The refinery installation was under-



Company planes play a large part in maintaining Aramco communications.

taken at the request of the Allied governments after the threat of German invasion through North Africa was eliminated. Originally the plant was designed to process 50,000 barrels of crude per day. It had cost $50 million when completed early in 1945. Equipment included primarily two three-stage crude stills with usual auxiliaries. In the intervening years crude capacity of the plant has been expanded to 189,000 b/d and thermal reforming capacity to 24,000 b/d. Crude runs in 1953 averaged 204,273 b/d, somewhat in excess of rated capacity.

In 1953 Aramco added a new 25,000-barrel topping unit and a $2,150,000 catalytic polymerization unit. Plans are afoot to install a 12,500-barrel fluid hydroformer for 1955 completion.

Products manufactured in 1953 included 13.3 million barrels of gasoline, 7.6 million barrels of kerosine, 17.2 million barrels of diesel fuel, 33 million barrels of fuel oil, 267,000 barrels of asphalt and 12,600 barrels of LP Gas. Crude runs by years are shown in Table III.

A major project of Aramco interests since the close of World War II was the laying of the Trans Arabian Pipe Line across the Arabian desert from the Persian Gulf to Sidon on the Mediterranean sea. This $160 million project first was suggested by military authorities in 1944 as a means of supplying the armies fighting in Europe at a time when tanker tonnage was short. Actual construction of the line was not undertaken, however, until after the close of the war.

Construction of the line was authorized on March 10, 1947 and final weld on the 1,068-mile line was completed on September 25, 1950. First oil was delivered to tankers at Sidon on December 2, 1950.

The line consists of 30 and 31 inch pipe and has a current capacity of 300,000 b/d with six stations in operation. A maximum capacity of 500,000 b/d can be attained by the addition of more pumping stations.

Deliveries to the line from the originating station at Qaisumah totaled nine million barrels in 1950. Most of this was required to fill the line and terminal storage. In 1951 average line throughput was 295,000 b/d. This was stepped up to 313,000 b/d in 1952. Last year the line pumped 308,000 b/d.

Concurrent with the improvement in the agriculture, general business and standard of living in Saudi Arabia, Aramco has been active in encouraging the installation of retail marketing facilities by Arabs. Pumps, tanks and other equipment have been imported and made available to merchants in all parts of the nation. Aid has been given in engineering design. The company itself has installed bulk storage to support the retail outlets.

In 1953 gasoline demand in Saudi Arabia rose more than 20 percent and diesel fuel nearly 30 percent. Kerosine consumption rose 50 percent and liquefied gas usage was tripled. The same was true of asphalt.

Aramco bulk plants have been established at Jiddah on the Red Sea, at Riyadh and other points on the Saudi Government railroad and at all Tapline pump stations. In 1953 sites were selected and equipment ordered for four additional bulk plants.

Aramco's policy has been to train and employ Saudi Arabs in every possible job at all levels. In the past five years Saudi employment has risen 35 percent from 10,026 to 13,555 with a constant rise in grade as shown below:

DISTRIBUTION BY GRADE OF SAUDI EMPLOYEES

	Grade	*1949*	*1953*
Senior Staff	—	—	11
Intermediate	10	—	4
	9	7	10
	8	4	24
	7	19	179
	6	54	574
General	5	417	1,373
	4	1,372	2,897
	3	1,943	3,424
	2	2,313	3,199
	1	3,897	1,920

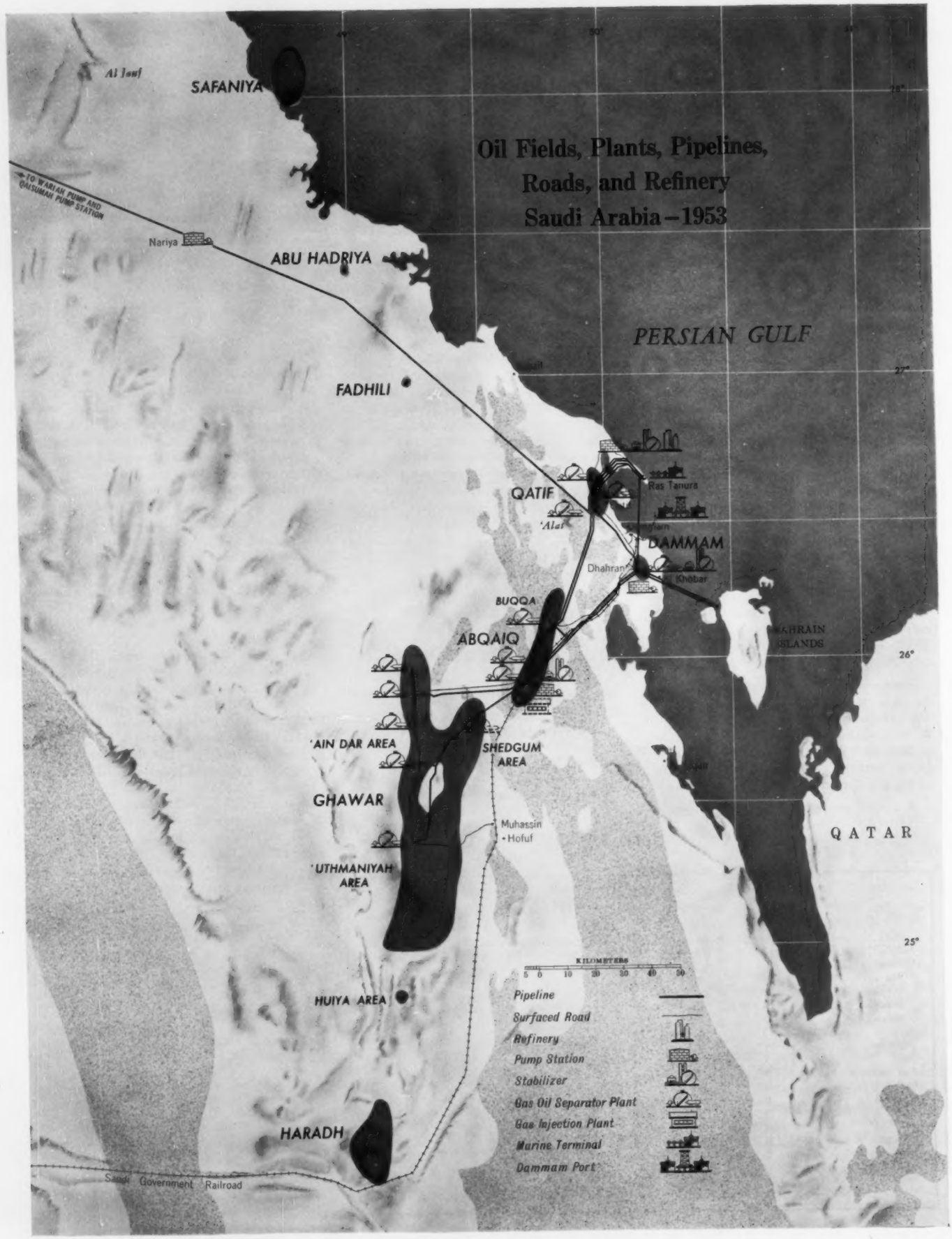
To assist the employees in moving up to better jobs, the company conducts classes in job skills and offers general and industrial education. In 1953 average enrollment in job skill classes was 3,131, in general and industrial education 4,875.

TABLE II

Status of Wells at End of 1953

Field	Producing	Shut in or Standing	Observation	Suspended	Abandoned	Drilling	Total
Abqaiq	52	12	2	0	0	0	66
Ghawar							
Ain Dar	39	9	2	0	1	0	51
Uthmaniyah	11	22	2	0	1	1	37
Shedgum	0	10	1	0	1	1	13
Huiya	0	1	0	0	0	1	2
Haradh	0	6	0	1	0	0	7
Dammam	29*	1	1	0	10	0	41
Qatif	9	0	2	1	1	0	13
Abu Hadriya	0	1	0	1	1	0	3
Fadhili	0	1	0	0	0	0	1
Safaniya	0	15	1	0	0	0	16
Alat	0	0	0	0	1	0	1
Jauf	0	0	0	0	1	0	1
Ma'aqala	0	0	0	0	1	0	1
Stratigraphic Test	0	0	0	0	0	1	1
Total	140*	78	11	3	18	4	254

*Including 3 gas wells.


Oil Fields, Plants, Pipelines,
Roads, and Refinery
Saudi Arabia – 1953
Al Jauf
SAFANIYA
TO WARIAH PUMP AND QAISUMAH PUMP STATION
Nariya
ABU HADRIYA
PERSIAN GULF
FADHILI
QATIF
'Alat
Ras Tanura
DAMMAM
Dhahran
Khobar
BUQQA
ABQAIQ
BAHRAIN ISLANDS
'AIN DAR AREA
SHEDGUM AREA
GHAWAR
Muhassin
Hofuf
'UTHMANIYAH AREA
QATAR
HUIYA AREA
HARADH
Saudi Government Railroad
KILOMETERS
0 10 20 30 40 50
Pipeline
Surfaced Road
Refinery
Pump Station
Stabilizer
Gas Oil Separator Plant
Gas Injection Plant
Marine Terminal
Dammam Port
26°
25°

Higher education beyond company facilities was given 25 employees by scholarships to various universities.

Safety education has been stressed by Aramco with the result that the accident frequency rate has fallen from 42.2 injuries per million man hours in 1947 to 8.2 injuries in 1953.

Aramco has assisted in the nation-wide campaign against illiteracy both within and without the company. Last year it undertook to construct ten primary schools in eastern Saudi Arabia.

Assistance to Arab employees has been extended to home ownership on the part of those not living in company camps. Interest-free loans and technical aid are extended to qualified Saudi employees. At the end of 1953, 233 employees had such homes or had qualified for loans.

Aramco activities outside the sphere of oil production have been an exemplification of the Point 4 program of the United States government; in this case by private rather than public means.

In the very early stages of Aramco's development, it began to assist Saudi Arab agriculture by bringing in experts from abroad, surveying and developing water supplies and teaching farmers to conserve water. More recently the company has aided the government in developing poultry and live stock farming.

The company built a modern 400-mile diesel powered railroad and a modern port which has been turned over to the government on completion. A radio system now is being installed for the government.

Municipalities as well as the central government have been aided in health matters and other phases of city planning. When Aramco entered Saudi Arabia, the general level of public health was not good. High percentages of the population suffered from trachoma, tuberculosis, malaria, malnutrition and a dozen other diseases prevalent in the Middle East. Working with the enthusiastic cooperation of the Saudi Arabian government, Aramco has provided ways and means leading to better health and better living conditions. The company built a million-dollar hospital for Saudi Arab employees. Nearby towns were cleaned up; increasingly larger segments of the population are being inoculated against diseases. School children are watched and treated daily when necessary.

General result of the enlightened policies of the Arabian American Oil Company has been to minimize the traditional suspicion which Arab nationals had exhibited toward all foreigners during the first third of the present century while the nation was being consolidated under the leadership of Ibn Saud. With great sums from oil royalties flowing into the national treasury, the present ruler, King Saud Ibn Abdul Aziz, is continuing the advances in living conditions which his father promoted by careful use of government income. The new King is widely traveled and fully trained for his job. He is considered a wise and able ruler who will make the most of his unusual opportunities.

An Aramco drilling rig forms a modern background for the familiar rural scene of a young Arab shepherd with his flock of sheep.

Aerial view of the Trans-Arabian Pipe Line Company's pump station at Qaisumah, Saudi Arabia.

Saudi Arab railroad men spreading crude oil along the right-of-way of the Saudi Government Railroad to control blowing sand.

TABLE III

Crude Oil Refined at Ras Tanura *1945-1953

Years	Barrels
1945	2,953,623
1946	29,297,101
1947	39,065,060
1948	45,086,139
1949	46,269,619
1950	38,364,335
1951	58,107,534
1952	62,204,161
1953	74,559,673

*Present refinery placed in full operation in December, 1945.

TABLE IV

Government and Public Use of Aramco Products (barrels)

Product	1951	1952	1953
Gasoline	503,180	671,560	811,454
Diesel Fuel	181,314	269,811	361,514
Liquefied Petroleum Gas	406	2,514	7,735
Asphalt	35,557	34,103	101,875
Kerosine	51,336	109,172	155,612
Other	12,491	26,655	28,437
Total	784,284	1,113,815	1,466,627

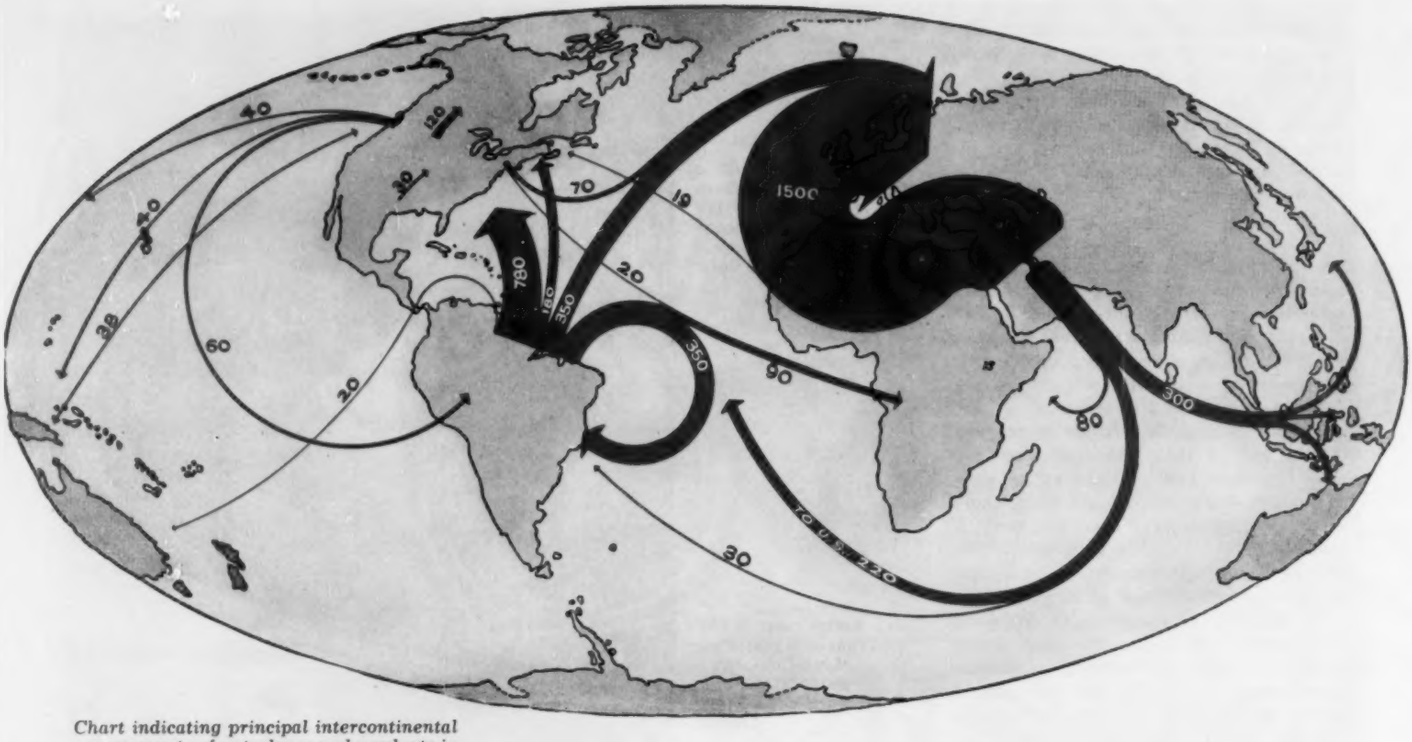


Chart indicating principal intercontinental movements of petroleum and products in 1953. Figures indicate approximate shipments in thousands of barrels daily. Arrows are not intended to show route followed, only origin and destination continents.

WORLD OIL CONSUMPTION UP 5.5 PERCENT

Demand for petroleum products in 1954 is expected to approximate 14,330,400 barrels daily. Consumption outside the United States probably will rise 8.3 percent.

WORLD DEMAND FOR PETROLEUM in 1954 is expected to rise 5.5 percent to 14,330,400 barrels daily based on estimates gathered by WORLD PETROLEUM. The estimates reflect the trend observed in the first half of the year.

In 1953 world consumption averaged 13,583,700 b/d, an increase of 6.4 percent over the 12,766,500 b/d consumed in 1952.

Figures used in the WORLD PETROLEUM estimates are on a crude oil and natural gasoline basis to include all liquid fuels and lubricants.

Based on production records of the first six months, this may be the first year in the past four in which consumption will exceed production. For the past three years, supply has exceeded demand by about 300,000 b/d. In the United States alone in 1953, total liquid stocks of petroleum increased at the rate of 148,000 b/d compared with an increase of 135,000 b/d in 1952. Stock accumulations in other parts of the world were proportionately as large or larger than in the United States.

Daily average crude production throughout the world in the first half of this year averaged about 13,242,000 b/d and natural gasoline and other liquid hydrocarbon output is estimated at about 810,000 b/d, bringing total new supply to 14,052,000 b/d, about 280,000 b/d below estimated demand on a daily average basis for the year as a whole. The estimate that stocks may be drawn on this year depends, of course, on the producing level during the remainder of the year. Some effect will be felt from the return of Iranian oil to world markets in the latter part of the year if the consortium is able to complete its organization plans and begin producing operations. This effect is not expected to be important in 1954.

The upward trend in oil inventories in the United States has not yet been halted. At the end of May, reports of the U. S. Bureau of Mines indicated that domestic stocks had risen 45 million barrels in the first five months, a build-up at the rate of 370,000 b/d. At the end of July, stocks had risen another 14 million barrels to 744 million.

A difficulty from the standpoint of domestic producers in the United States is the smaller rate of increase in demand here than in other parts of the world. In the first five months of the year, domestic demand in the United States was only 1.3 percent higher than in the same months

in 1953, and the most recent Bureau of Mines estimate for the year contemplates a rise of only 3.3 percent. Elsewhere in the world it is estimated that consumption will rise 8.3 percent.

In the Caribbean and South American area, demand this year apparently is rising at the rate of about 6.3 percent. The somewhat soft state of business in the United States drops Western Hemisphere consumption to 4.4 percent over 1953.

The rise in oil consumption in the Eastern Hemisphere is on a relatively uniform basis by regions. It is estimated that European demand will be 8.7 percent higher this year than last. Africa is expected to be 7.5 percent higher, the Middle East 7.9 percent and the Far East and Oceania up 9.0 percent.

An accompanying flow chart superimposed on a world map gives an estimate of major intercontinental movements of petroleum and products in 1953. The chart reveals a continuing change in the pattern of world trade which has been brought about by the growth of production from Middle East fields.

In 1953 Middle and Near East production rose 159,000 b/d to 2,468,000 b/d, while demand in the area rose only 21,000 b/d to 261,700 b/d. Exportable surplus in 1953 was 2,206,000 b/d, an increase in this category of 138,000 b/d.

Europe is the largest customer for Middle East oil, taking about 1.5 million barrels daily in 1953, an increase of about 10 percent. The United States increased its takings by about 70,000 b/d to a little over 220,000 b/d, East Asia and Oceania required about 300,000 b/d of Persian Gulf oil to make up its continuing deficit. The Middle East also supplied directly about 80,000 b/d to Africa and indirectly perhaps 100,000 b/d through re-exports from European refineries processing a mixture of Middle East and Caribbean crudes.

European demand for Latin American oil continued to shrink and now is only about half of what it was a few years ago. Caribbean fields have been provided an offset by the continued phenomenal increase in consumption in Latin America itself, notably in Brazil and by increasing shipments to North America. Canada is not expanding its purchases, but the United States continued to depend on Venezuela and Colombia for much of its imported oil, the Caribbean shipping about 780,000 b/d to this country. A new movement of imported crude was 38,000 b/d to the Pacific Coast from Sumatra.

A study of the industry's current position suggests that although demand is increasing at the rate of 750,000 barrels per year on a daily average basis, the rate of discovery is even greater. It thus becomes necessary for the industry to continue giving careful thought to the volumes of crude which can be lifted and products manufactured if inventories are not to get out of hand.

ESTIMATED WORLD CONSUMPTION OF PETROLEUM PRODUCTS

(Crude Equivalent Basis)
(Thousands of Barrels)

	1953		1954		
	Total	Daily Average	Total	Daily Average	Percent Change
Canada	186,880	512.0	205,495	563.0	
United States	2,800,280	7,672.0	2,892,625	7,925.0	
Mexico	63,875	175.0	69,350	190.0	
N. America	3,051,035	8,359.0	3,167,470	8,678.0	+3.8
Argentina	66,685	182.7	69,386	190.1	
Brazil	53,436	146.4	60,481	165.7	
Chile	9,527	26.1	11,169	30.6	
Colombia	12,957	35.5	13,906	38.1	
Cuba	19,199	52.6	20,002	54.8	
Neth. West Indies	52,633	144.2	53,509	146.6	
Peru	12,482	34.2	13,478	37.2	
Trinidad	14,235	39.0	14,518	39.5	
Uruguay	9,381	25.7	9,855	27.0	
Venezuela	43,289	118.6	45,552	124.8	
Others	12,373	33.9	13,505	37.0	
S. America & Caribbean	306,198	838.9	325,361	891.4	+6.3
WESTERN HEMISPHERE	3,357,233	9,197.9	3,492,831	9,569.4	+4.4
Belgium	24,327	66.6	26,743	73.3	
Denmark	15,333	42.2	16,768	45.8	
Finland	5,824	16.2	6,140	16.8	
France	97,332	266.6	104,335	285.8	
Germany (Western)	50,644	138.7	57,755	158.2	
Greece	9,515	26.1	9,797	26.8	
Ireland	5,949	16.3	6,246	17.1	
Italy	53,926	147.7	57,798	158.3	
Netherlands	30,399	83.3	32,568	89.2	
Norway	13,838	37.9	14,890	41.0	
Portugal	7,377	20.2	8,001	21.9	
Spain	14,363	39.4	17,525	48.2	
Sweden	39,593	108.5	43,409	118.9	
Switzerland	10,553	28.9	11,446	31.3	
United Kingdom	153,862	421.5	161,823	443.4	
Yugoslavia	4,178	11.4	4,598	12.6	
USSR	394,200	1,080.0	430,700	1,180.0	
Others	163,520	446.5	178,850	490.0	
Europe	1,094,733	2,998.0	1,189,392	3,258.6	+8.7
Algeria & Tunisia	12,984	35.6	14,132	38.7	
Brit. E. Africa	6,522	17.8	7,086	19.4	
Egypt	30,659	84.0	32,277	88.4	
Ethiopia & Fr. Somaliland	3,931	10.8	4,690	12.9	
French Morocco	6,570	18.0	7,263	19.9	
South Africa	23,312	63.2	25,031	68.7	
West Africa	20,805	57.0	22,593	61.9	
Others	25,915	71.0	27,448	75.2	
Africa	130,698	358.1	140,520	385.1	+7.5
Aden	19,327	53.0	20,319	55.5	
Bahrain	5,237	14.3	5,056	13.9	
Iran	10,479	28.7	11,020	30.2	
Iraq	5,738	15.7	6,249	17.1	
Israel	7,698	21.1	8,349	22.9	
Saudi Arabia	14,965	41.0	16,571	45.4	
Syria & Lebanon	5,611	15.4	6,414	17.6	
Turkey	7,923	21.5	9,004	24.7	
Others	18,615	51.0	20,075	55.0	
Middle East	95,593	261.7	103,057	282.3	+7.9
Australia	45,990	126.0	47,413	129.9	
Ceylon	6,205	17.0	6,643	18.2	
Hong Kong	4,565	12.5	4,797	13.1	
India	30,295	83.0	33,215	91.0	
Indonesia	20,075	55.0	24,674	67.6	
Japan	53,827	147.5	72,452	198.5	
Malaya	19,710	54.0	22,046	60.4	
New Zealand	9,721	26.6	10,606	29.1	
Pakistan	9,462	26.0	10,950	30.0	
Philippines	11,894	32.5	12,866	35.2	
S. Vietnam	4,152	11.4	5,589	15.3	
Thailand	3,483	9.5	3,931	10.7	
Others	51,955	167.0	21,440	136.0	
Far East & Oceania	271,334	768.0	276,622	835.0	+9.0
EASTERN HEMISPHERE	1,592,358	4,385.8	1,709,591	4,761.0	+9.7
WORLD TOTAL	4,949,591	13,583.7	5,202,422	14,330.4	+5.5

JATIBONICO find stimulates exploration activity in Cuba

By Ruth Sheldon Knowles

IT WASN'T a big discovery well. They measured the flow of low gravity oil at 250 barrels daily from 1,072 feet. But there is no way to measure the flow of excitement being caused by this wildcat in a sugar cane field in central Cuba.

It set the people of the little town of Jatibonico dancing in the streets last May Day night. Within hours, it was televised so that all could see for themselves the most exciting discovery since Columbus laid eyes on the island. Overnight, oil replaced sugar as the topic of conversation wherever people gathered, at government cabinet meetings, business and banking conferences, diplomatic dinners, canasta parties, corner bars and cock fights.

Not since the day Cuba was liberated from the Spanish yoke has there been such glowing, optimistic talk about the nation's future. The discovery of major petroleum reserves would mean liberation from the island's one-crop economy. Development of an adequate source of natural fuel would mean industrialization and relief from high-priced imports. Western Hemisphere defense would be strengthened by defensible new reserves 58 minutes by air from Miami.

Newspapers, magazines and radio stations vied with one another to report every detail and interview everybody on the subject from President Battista to the man in the street.

The excitement spilled out over the shores and spread to the oil centers of the world. This wasn't just the discovery of a new oil field. It was the opening up of a great untested sedimentary basin and confirmation of the potentialities of two other large unexplored basins.

Major company geologists dug into the old files to take a new look at reports, maps and conclusions. Independents, alert for new hunting grounds, started making plane reservations when they heard the additional news that operating costs and conditions in Cuba were on a par with Louisiana, with the most favorable oil laws outside the United States. The bar at the Hotel Nacional took on the look of a merger of the Tulsa, Dallas and Houston Petroleum Clubs.

A group of California and Dallas independents announced plans to start a wildcat drilling program before the end of the year. Two Tulsa independent oil companies revealed similar plans. A Cuban group began figuring on a shallow wildcat program. The public clamored to be permitted to buy more stock in a newly organized Cuban exploration company, Latin America's biggest such private enterprise venture. Standard Oil Company (N.J.) advised the government it was opening a land department in Havana and planned to reactivate its exploration program. The familiar wheeling and dealing prelude to the opening up of any new oil area began to get into full swing.

The government put out the red carpet for wildcatters. "Oil men will find no other government in the world as cooperative as the Cuban government," announced Dr. Amadeo Lopez Castro, president of the Cuban Development Commission.

Anyone spending a million dollars in exploration can get a government loan, to be repaid out of oil, for an amount up to two-thirds of his available capital. An exploration dollar in Cuba can now do $1.66 worth of work. The government exempted exploration companies from the majority of taxes, reduced concession rentals, and offered the inducement of a 10-year extension of the 30 year exploitation period to anyone finding oil in the next five years.

American Ambassador Arthur J. Gardner enthusiastically welcomed exploration companies in Cuba with the assurance that the Embassy staff would give them every assistance possible, recognizing that no other development could be more important to Cuba than the uncovering of petroleum resources.

Tourists in Havana, bent on spending an evening at the Tropicana night club and buying a hamper of rum, couldn't be blamed for thinking that this is the first oil ever found in Cuba. In one way they are right and in another they couldn't be more wrong.

Cuba started making oil history in 1492, for Columbus reported oil seeps there among the other wonders found in the new world. He hardly needed to get off the Santa Maria to see them, as Cuba has more physical evidences of oil than almost any other area of like extent. Its first oil field, Bacuranao, was discovered in 1864, five years after the Drake well. In 1881, while Pennsylvania was still in full boomtide, Texas was just beginning and Oklahoma had yet to see its first production, Cubans were bringing in oil wells at Motembo with initial production of 775 barrels a day. And this was oil the like of which the United States has seldom seen, pure naphtha which could be used direct from the well in an automobile gas tank or on a suit of clothes.

Another field, Jarahueca, was discovered in 1943, but the combined production of the three fields to date has been only some three million barrels. This wasn't big enough bait to lure the oil finders away from more spectacular discovery areas elsewhere in the world.

From 1930 to 1947, Jersey Standard, Atlantic, Shell and Gulf drilled 27 major exploratory wells without finding commercial production. All but Gulf ceased active exploration thereafter. By 1947 Cuba's geological challenge was practically relegated to academic arguments rather than drilling programs. Even the arguments couldn't be definitive because 27 dry holes in a petroliferous island extending over 28 million acres, plus great submerged shelves, is a mere beginning in exploring a potential oil area. Furthermore, drilling had been confined almost entirely to the northern coast where oil seeps are most frequent.

The negative attitude of the major oil companies became as great a psychological barrier to exploration as was the physical barrier of complicated geology. However, independents notoriously (and sometimes successfully) rush in where majors fear to tread. Five years ago a group of Cuban, Venezuelan and American businessmen, industrialists and oilmen decided to meet this challenging gamble on an ambitious scale. Headed by Warren W. Smith, former president of Pantepec Oil Co. of Venezuela, the Cuban Venezuelan Oil Voting Trust retained Florent Bailly, well known geologist and head of Oil Properties Consultants Inc. of Pasadena, to direct a comprehensive general geological study of Cuba.

Mr. Bailly's reconnaissance work on the whole island developed a fresh approach to the oil finding problem. He believed that the best prospective areas of Cuba were on the southern side of the island, as the southern basin areas are comparatively unaltered and show a minimum disturbance as contrasted to the north coastal and central uplifted regions which are extensively disturbed by sharp folding, overthrusting, faulting and igneous intrusions. These conclusions were substantiated by extensive gravity meter and magnetometer surveys made by Exploration Surveys Inc. of Dallas. Seismograph was not used as, until a reliable stratigraphic column could be ascertained, there was nothing to talk back to the seismograph, as tests already had proved.

CVOVT's scientists were convinced that the chances for discovering commercial quantities of oil in Cuba were excellent and that possibilities equalled those of other wildcat country. Mr. Bailly pointed out that the south coast of Cuba contains the old shorelines of the ancient Mediterranean Sea, which extended from Persia to California, and that the same fossils are found in the same sediments in Iran and Cuba.

That Cuba is real oil country was also the opinion of two of the world's most eminent geologists, Dr. E. DeGolyer and Wallace Pratt. Dr. DeGolyer did some of his first geological work in Cuba and, after seeing the failure to find oil in the north, stated that the problem in Cuba is not whether there is oil, but how to localize its position. Mr. Pratt summed up the matter by stating that "while several deep wells have been drilled, exploration to date has been far from definitive."

CVOVT obtained concession rights on some 16 million acres blocked solidly in three major untested sedimentary basins; the Jatibonico basin, stretching southward to the outermost keys from the center of the island in the provinces of Camaguey and Las Villas; the Zapata basin, including the peninsula of that name, in the southern part of the provinces of Matanzas and Las Villas, including also areas of the keys; and the Cauto basin, traversed by the Cauto River, in the central and southern parts of the province of Oriente outward to deep water.

While American oil companies were still looking at Cuba with their skeptical oil-finding eyes (the one used to look at oil areas before oil is discovered, the other being reserved for the vision necessary to see possibilities after oil has been found), Cubans did something unprecedented in Latin American oil history.

A group of Cubans prominent in sugar, rum, banking and industry formed Trans-Cuba Oil Company, under the sponsorship and presidency of Dr. Viriato Gutierrez and contracted with CVOVT to explore half their concession rights. For the first time in any Latin American country, national private enterprise was taking the initiative in stimulating the development of its country's oil potentialities. This prompted the Cuban government to announce that to encourage development it would match dollars for exploration drilling without receiving any participation, the funds to be repaid out of oil discoveries.

The government already had evidenced its eagerness to encourage development by purchasing in 1952 a National 75 rig of 8,000-foot drilling capacity. Last December it was used for the first time. The Jarahueca-Motembo group headed by Havana lawyer Dr. Antonio Iglesias, contracted for the rig to drill on a 29,000 acre concession near the town of Jatibonico and in the center of a big block of concession rights. The location was based on CVOVT's geological and geophysical reports which were made available to the Cuban government and to Dr. Iglesias.

The Jarahueca-Motembo group also owns a 1,000-barrel refinery near Jatibonico operating on some 120 barrels a day of Jarahueca and Motembo crude with the balance being import crude processed under contract with Standard Oil Co. (N.J.). The government industrial and agricultural bank loaned the group $275,000 to renovate the refinery and provide $120,000 to finance a deep exploration test. The government then suspended the 10 cents per gallon refining tax on gasoline for the group's refinery, with 60 percent of this going to repay the loan and 40 percent to feed an exploration drilling fund.

The group, all Cubans who have dabbled in oil on a small scale for many years, decided to get an American drilling contractor for the deep test and contracted with Kerr-McGee Oil Industries of Oklahoma City on a cost basis plus option to participate.

So, on December 27, 1953, Echevarria No. 1 was spudded in. No one was more interested than Evelio Echevarria, who owns a checkerboard one-half of the concession. As an employee of the Jatibonico sugar plantation where the well was located, he had noticed oil seeps 15 years ago, had studied books on oil and taken out the concession, hoping some day to be able to interest someone in drilling on it.

Major company geologists belonging to the north coast geological school of thought predicted this first deep test in the central and southern basins would hit basement at 2,000 feet. They also argued that deep tests in the general southern area would find nothing but an interminably deep series of tuffaceous material.

Echevarria No. 1 upset all the old theories. Bottomed at 8,350 feet, principally due to the rig's drilling capacity,

Cuba's new discovery, Echevarria No. 1, was drilled appropriately in a sugarcane field, for Cuba now pins her future economic hopes on oil liberating her from her dependence on sugar.

the section had been sedimentary all the way with indications that limestones of the lower Cretaceous could be expected below that depth. The Cuban government's development commission retained Mr. Bailly as technical inspector of the well. After examination of the lithologs, cuttings and electric logs, he reported 37 oil zones, nine of which were excellent, 11 good, nine fair, and eight poor.

Like a theatrical production which is an artistic success but a box-office flop, Echevarria No. 1 looked at first as though it would be a non-producer in spite of its important geological findings. Drill-stem tests had produced nothing. However, Dr. Iglesias decided to have Schlumberger run all types of electric logs possible, a decision which is not a routine one for an independent drilling the only wildcat in a country where there are no facilities for such testing. He also retained R. G. Hamilton of Tulsa, independent electric log expert, to analyze them. Dr. Hamilton recommended testing three zones, 1,630-1,642 feet; 1,304-1,320 feet; and 1,072-1,130 feet.

Due to lack of facilities and adequate technical personnel on the ground, the two lower zones were not properly tested. But Echevarria No. 1 was destined to produce. The upper zone blew in while sample perforations were underway at that point. The flow of 250 barrels a day from the Upper Cretaceous was immediately recognized in the oil world as Cuba's first major oil strike.

This is not just the discovery of a new field. It opens up the great untested Jatibonico sedimentary basin and promises other exciting surprises in the two major untested sedimentary basins.

Although the discovery of good shallow production in the deep test is somewhat like going to China to buy a box of tea instead of running down to the corner grocery store, experts who have studied the electric logs in detail state that the numerous shows of oil and gas in porous beds in the deeper formations make them potential oil or gas reservoirs when found under favorable structural conditions. There are even deeper zones in this well, which properly tested will undoubtedly produce.

The discovery itself is a far better well than its actual record to date, for nothing has yet been done to test it according to good engineering practices. A bad cement job or a mud block, or both, undoubtedly accounts for the flow of emulsified oil. Every now and again it cleans itself out momentarily. After a few weeks it settled to about 90 barrels a day flow and then suddenly dropped to 16 barrels. Fourteen barrels of diesel oil were put in the hole and it promptly started flowing 160 barrels a day and continues to hold up steadily. This is particularly surprising in view of the fact that it is 14.8 gravity oil. An offset well, properly handled, undoubtedly will prove as significant in revealing the importance of the discovery as a field as the discovery has proved significant in revealing the importance of the basin as a whole.

Echevarria No. 1 shows that exploration costs in Cuba in any planned program should not exceed those in the United States. The 8,350 foot test cost approximately $150,000, in spite of relatively heavy charges which any lone outpost in a new area inevitably has.

Reasonable exploration costs and favorable oil laws are factors attracting independent oil men to this new hunting ground at the very back door of the United States. First to break the ice after the discovery well was a California and Texas group who formed Cuban American Oil Co., with Tevis F. Morrow, Los Angeles, president; Herbert W. Klien, Dallas, executive vice president; Grady Vaughn, Jr., Dallas, vice president; and Ralph Maddox, Dallas, treasurer. They signed a contract with CVOVT and Trans-Cuba Oil Co. to drill 40,000 feet of exploratory wells for an undivided half interest in 750,000 acres located in the Jatibonico and Cauto basins. They are shipping a 10,000-foot drilling rig to Cuba to begin the first well before the end of October. Cuban American has a two years' option to obtain a like interest in an additional amount of land, if it is available, by drilling an additional 80,000 feet of exploratory wells. CVOVT and Trans-Cuba are negotiating for additional exploration contracts on their large holdings.

Sterling Oil Co. of Tulsa, of which Jesse True is president, signed a contract with Caribbean Associates, an American and Cuban group headed by Leonard E. Brownson of Havana, who several years ago acquired concession rights on an estimated five million acres adjoining CVOVT blocks in the three major southern basin areas, the greater part of which is on submerged shelves. Sterling Oil Co. received a checkerboard half of the concession rights, carrying an overriding royalty, in return for drilling an undisclosed number of feet exploration wells, with drilling operations to begin before the end of September. Sterling has several geologists in the field doing reconnaissance work. Deep Rock Oil Corp. of Tulsa is negotiating with Sterling to join this undertaking as operating partner.

Clarence Moore, former attorney of the American Embassy in Havana, who has been an independent oil operator in Cuba for several years, owns the shallow rights to 112,500 acres scattered through a Gulf concession block. A group of Cuban businessmen has made a contract to develop this acreage and is bringing in a shallow rig to begin immediate operation.

The Jarahueca-Motembo group and Echevarria are both making plans for development of the Dos Estrellas concession on which the discovery well was drilled. The group also plans to drill a deep test in the Jarahueca field.

All this independent activity is nudging the major companies into action. Jersey Standard is once again making an active geological study of the island and is reopening its land department and reactivating its exploration program. Atlantic Refining Co. has had a crew of 12 geophysicists carrying out gravity meter, magnetometer and seismograph surveys in its holdings in the northwestern and north central parts of the province of Camaguey. Shell is conducting an active gravity meter and seismograph survey of its holdings in the northwestern part of Camaguey. Shell also has announced that it is studying plans for a $30 million refinery in Havana. Standard Oil Co. (N.J.) made known two years ago that it planned to spend $17 million in expanding its 4,200-barrel Havana refinery, but no definite steps have been taken to date.

Gulf has been Cuba's "Old Faithful" among major companies. During the past few years it drilled two deep offshore tests and has kept up a steady geological research program. Last year Gulf released its concessions along the north coast of Matanzas, Las Villas and Camaguey, moving its search inland and southward. It obtained large concessions from the government in the center of Las Villas province and others from private owners in central and southeastern Las Villas. The company is carrying out an extensive core drilling program, 3,000-foot stratigraphic tests and intensive surface geological work.

An additional incentive to wildcatters is Cuba's 50,000 barrel a day market, now supplied by imports. Furthermore, it is a dollar market. This big market probably would triple as soon as a domestic oil supply was available. With economic fuel, all sorts of new industries would be developed. First would be the release of bagasse, sugar cane pulp now burned as fuel in the sugar mills, for raw materials to establish newsprint and other manufacturing industries.

"Nothing could be more important to Cuba than the development of its oil potentialities," says Dr. Amadeo Lopez Castro, president of the Cuban Development Commission. "We are completely dependent upon sugar and we now have a million unemployed in the island. Development of our oil resources would bring employment. That is why the government is anxious to do everything possible to encourage it."

Dr. Lopez Castro stated that the Cuban government had no intention of changing its oil law, which was enacted following the Mexican expropriation and was designed deliberately to encourage investment of private capital rather than to discourage it. Dr. Lopez Castro fathered that petroleum law. He affirms that the government has no desire or intent to participate directly in the oil business.

"Oil men will find no other government in the world as co-operative as the Cuban government," states Dr. Amadeo Lopez Castro, president of Cuban Development Commission and father of Cuba's oil law.

Oil seeps which sugarmill employee Evelio Echevarria, left, found fifteen years ago led him to take the concession upon which the Grupo Jarahueca Motembo, headed by Havana lawyer Dr. Antonio Igelsias, right, drilled the Jatibonico discovery well.

Sightseers from all over Cuba came to see Echevarria No. 1 flowing oil into this pit in a sugarcane field.

"That is the business of oilmen, not of governments," he says.

In order to stimulate exploration, the government issued an unusual decree on July 23rd to be effective for the next five years. Any group or individual prepared to spend a minimum of a million dollars in exploration can obtain exploration loans from the government for amounts up to two-thirds of the operator's available capital. The government receives no participation, but if oil is found, the loan plus six percent interest and a 10 percent bonus is repaid out of 20 percent of the oil. Also, during the repayment of the loan, the operator pays a special royalty for the public works program which runs from 2.5 percent on 1,000 barrels monthly production to a quarter of one percent on a monthly production of 50,000 barrels.

Individuals or groups spending a million dollars or more in exploration are exempted for ten years from the first 10 percent of the profits tax and from the capital, stock issue and sundry taxes, provided that geological, geophysical and drilling exploration is started promptly and continued uninterruptedly.

Anyone discovering oil within the next five years will be given the option to extend the 30-year exploitation period for an additional ten years with the payment of 20 percent royalty instead of 10 percent in the case of the present shallow oil fields of Bacuranao, Motembo and Jarahueca, which now carry a 5 percent royalty to the government, the ten year extension being subject to a 10 percent royalty.

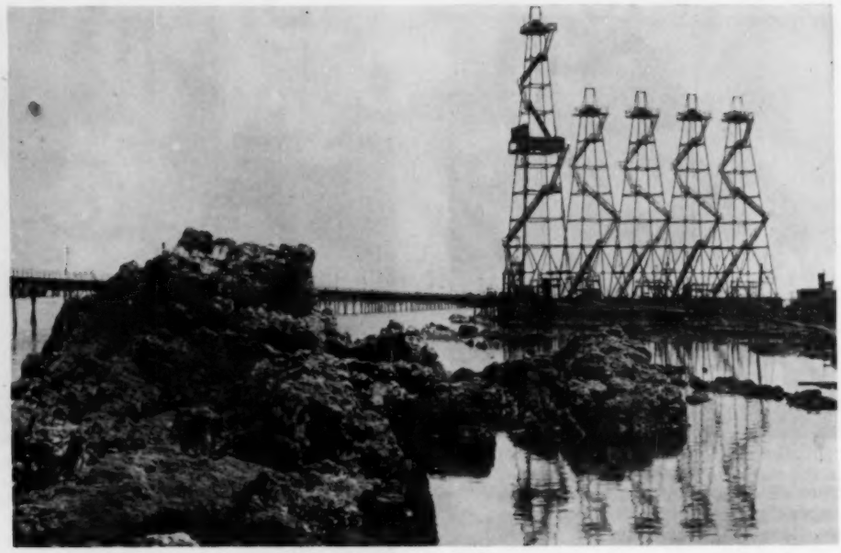
For the next five years rentals on exploration concessions are reduced from 15 cents a hectare (approximately six cents an acre) to five cents a hectare, or approximately two cents an acre.

Cuban oil exploration, one of the most astonishingly neglected wildcatting challenges in the Western Hemisphere, is finally underway. Veteran geologist Wallace Pratt lists the five essentials of an oil finder as faith—conviction that oil will be found in a given spot; persistence—not influenced by the laughs of others; venturesomeness—willing to take a risk and to be encouraged by his own enthusiasm; resourcefulness—ability to find places to dig for oil that have been passed or avoided by others; and imagination—imbued with vision.

These are the qualities which the independents who are starting to dig hole in Cuba must possess, but they wouldn't be digging hole if it had not been for the high degree to which these qualities have been exemplified by such men as Warren Smith, whose five years of work with CVOVT has been a principal factor in making Cubans and the oil world conscious of Cuba's oil potentialities; Florent H. Bailly, the geologist whose new approach to the geology of Cuba is now being recognized; Dr. Jorge Brodermann, Cuban Geological Survey director; and Ing. Antonio Calvache, Department of Mines director. These men have been unremitting in their work to increase the geological information of the island and to stimulate both Cuban and foreign interest in its potentialities. Businessmen who have sustained interest in oil development are R. J. Macaulay, manager of Cuban Gulf Oil Co., whose belief in Cuba's oil future has never flagged; Dr. Viriato Gutierrez, leading industrialist; Dr. Jose Ignacio de la Camera, vice president of the Trust Company of Cuba; and Jose M. Bosch, head of the Bacardi sugar and rum interests. Their deep convictions of the importance of oil exploration have been responsible for Cuban private capital participating through the organization of Trans-Cuba Oil Co., the biggest such venture in Latin America. Prominent in this movement is Dr. Antonio Iglesias, the lawyer who is a wildcatter in his bones and whose persistence paid off in Cuba's Echevarria No. 1 as the persistence of a New York lawyer, George H. Bissell, paid off in America's Drake well.

Echevarria No. 1 may well be to Cuba what Imperial Oil Co.'s No. 1 Leduc was to Canada. Oil was first discovered in Canada in 1859, but not until 1947 did the Leduc well unlock Canada's geological secrets. The Cuban story is a promising parallel.

M. Kaverochkin, drilling operator and holder of Stalin prize, who sank the first test wells in the Neftyanye Kamny oilfield.

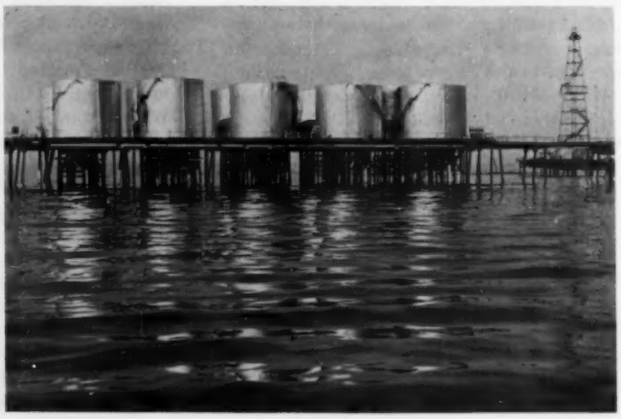


The first derricks put down on the oil rocks in the Caspian Sea. It was from this point that the field started to grow.

A section of the vehicular trestle at the Neftyanye Kamny oilfield.

Wells being drilled in the Caspian Sea oilfield.

Oil collecting points throughout the field deliver to these storage tanks.



View of a street in the Neftyanye Kamny oil workers' settlement.

Neftyanye Kamny

- city of oil rocks

ONE OF THE LARGEST and most celebrated of the world's oil fields is that of Baku, which takes its name from the city located on the Apsheron peninsula on the western side of the Caspian Sea. In reality there are numerous fields in the district surrounding Baku, but the name usually is applied to the whole area. Some of its famous wells had initial flows above 100,000 barrels per day. For many years the region provided 80 percent of Russia's petroleum outturn, and in the period just preceding World War II, it was yielding 450,000 barrels a day.

It has long been the belief of competent geologists that the formations yielding such rich returns to the fields around Baku did not end at the shore line, but extended underneath the Caspian, an opinion supported by discoveries of fields in Daghestan almost directly opposite, on the eastern side of the great inland sea. Actually some productive wells were put down beyond the water line on the western side before the late war, but these were close inshore and were drilled from platforms built out from the land. The prevalence of heavy storms on the Caspian and the lack of technical knowledge of underwater exploration and drilling acted as a deterrent to more extended efforts.

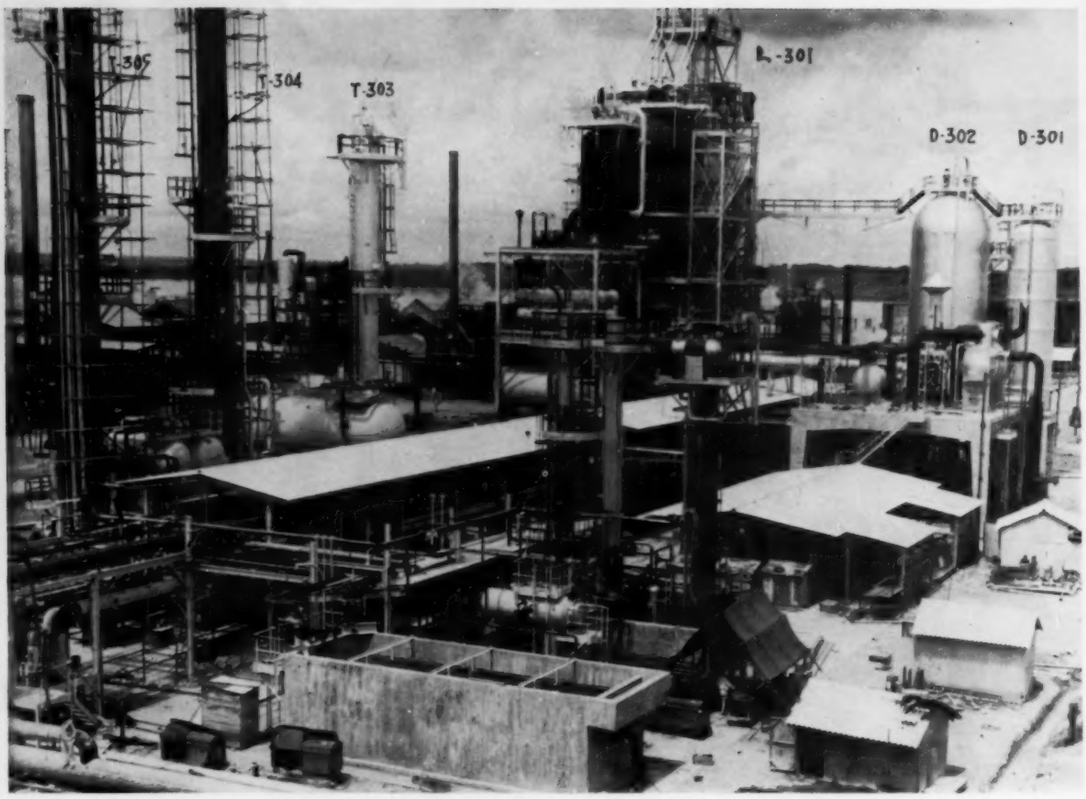
It was not until 1946 that a systematic effort to explore the sea bed was undertaken. The work faced great difficulties because of treacherous wind and water conditions. After some setbacks, a shoal some 60 miles offshore marked by a group of rocks was selected as a point for beginning operations. The reef itself was a notorious danger spot on which many ships had come to grief. A party of drillers was landed on the shoal, and after many difficulties succeeded in bringing in a producing well.

To develop a field, however, it was necessary to have a safe anchorage for vessels moving equipment and men. This problem was solved by sinking seven antiquated ships to form a breakwater, a device similar to that employed by the allies in their cross-channel invasion of the European continent in 1944. One of the vessels was sunk at an angle so that its cabins could be used as living quarters by the working staff. This "Island of the Seven Ships" was the beginning of what has become a busy and thriving town in the middle of a great intercontinental sea.

To provide a suitable base for drilling in the surrounding waters, three Soviet engineers (who later received Stalin prizes for their work) designed a new type of base for submarine work, built in sections and assembled on the spot. The foundation was moved to the island and swung into position by a powerful floating crane. The superstructure, about the size of a four-story house, was placed in position upon the base and a steel platform on top supports the drilling rig and other equipment.

As drilling continued and more wells were brought in, it became desirable to have the different working areas connected. There were times when rough weather made communication with the shore uncertain, when workers at the wells could not be relieved, nor supplies of food and water replenished. The desirability of having a community that could be stocked with ample supplies to make it self-sustaining over considerable periods was obvious. For this purpose, a series of trestles have been built, mounted on piles and with a framework of steel, capable of sustaining the heaviest trucks and providing passage for all kinds of vehicles as well as pedestrians. Owing to the remoteness of the location, it is advantageous to have living quarters for employees on the spot. For this purpose houses have been built for staff and workers as well as shops, theatres, a hospital and all the appurtenances of modern life. In this way, "Neftyanye Kamny," the City of the Oil Rocks, has come into existence as a bustling industrial community of workshops, stores, restaurants and storage warehouses. Twenty-five miles of roadways have been built and the flow of light and heavy vehicles and foot travelers has created a transportation problem requiring the use of traffic policemen.

A ship service between the oil rocks city and the mainland is maintained to deliver food, equipment, supplies and to transport oil from the storage tanks to refineries on shore. But if communication is interrupted, the people of Neftyanye Kamny can get along very comfortably in their man-made island home.



View of the New Barranca refinery, showing vis-breakers and catalytic cracking plant of Standard Development Co. design being built by Foster Wheeler Corp. Photo taken June 1954, courtesy Empresa Colombiana de Petroleos.

Colombia offers outstanding oil prospects

By E. Ospina-Racines

E. Ospina-Racines is the 1954 President of the Colombia Petroleum Institute and is the publisher of the weekly report "Oil Drilling & Production in South America" and "Colombian Oil-News Digest." He is also author of the book, "The Economics of United States and World Oil," which has sold in 37 different countries of the globe.

ACCORDING TO THE DATA of Table 1 herewith there are now 12 firms engaged in the oil business in Colombia. Of the 12 listed, seven are engaged in oil exploration and development; two in pipe line operations, and three in marketing.

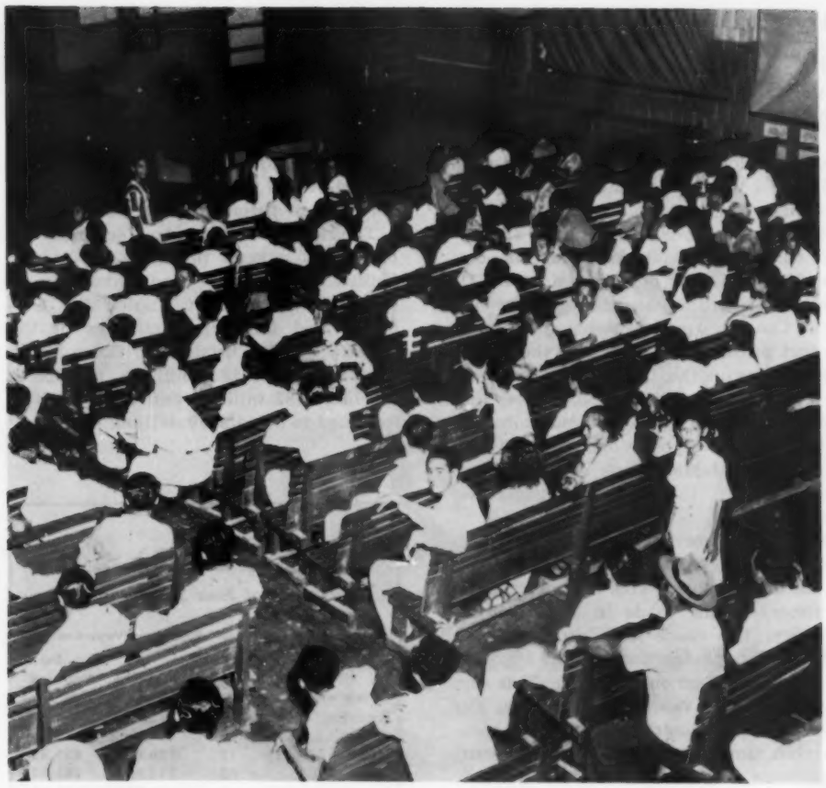
Colombia offers attractive possibilities to present and new oil operators on a long term basis. Today Colombia is competitive, not only geographically (it is said that Colombia is located on a "corner lot" with both the Atlantic and Pacific bathing its shores), but also offers favorable geologic and economic conditions together with a favorable government policy toward oil development. In the past two years various measures designed to promote oil exploration and operation have been adopted. They include amendment of the oil law whereby objections to certain measures have been removed and other features improved; free dollar exchange for the sale of crude, enabling the oil companies to retain the proceeds from its sale abroad; and a committee of the government and the oil industry has filed a recommendation to increase the depletion allowance, now 10 percent of the gross, to possibly 27½ percent as in the United States and other oil countries. Action on the latter recommendation is expected to take place after a new cabinet is announced, following the election of Lt. Gen. Rojas-Pinilla for a new term of office as President of Colombia.

The Minister of Finance in his 1954 report to the President cites the government's 10-point policy toward business and industry, of which the first four are significant to the oil industry. These four bases of official policy are:

(1) Private operation will be stimulated as well as the development of free enterprise, the state taking over only those activities not taken up by private initiative.

(2) The existing legislation, which guarantees outside capital investments made in Colombia and its timely reimbursement, will be maintained. The government seeks foreign capital to promote economic development of the country and is ready to give it all assistance and complete security.

(3) The government's policy of granting protection and encouragement to capital invested in the oil industry will be maintained.



Club house and movies for workers of Intercol at Barranca.

(4) Currency stability will be maintained through adequate credit and money control.

As may been seen from the data of Table II, total holdings in Colombia comprise 44 properties covering 2.5 million hectares or 6.1 million acres. This prospective oil area compares with 8.3 million and 6.2 million hectares now under contract in Peru and Venezuela. This indicates that Colombia offers large areas to prospect and lease from private oil owners or from the government directly. Since 1936 a total of 37 private oil properties have been recognized covering 441,315 hectares (1,090,000 acres), the most notable of which is the Texas fee property of Teran-Guaguaqui extending over 127,205 hectares wherein drilling has been in progress since 1945. A total of 60 wells have been drilled there, proving up one of Colombia's major oil fields, the Velasquez field, said to hold to date some 100 million barrels of commercial oil and being still under development. A 12-inch crude oil pipe line of 119 miles is now being built to connect with the Andian common carrier, and Texas' current 5,000 b/d oil output is expected to go to 25,000 b/d either in 1954 or early in 1955.

The nine oil producing properties listed in Table II, including the two under test, yielded in June 1954 a total of 115,824 b/d, about five percent over 1953 as may be seen from the data of Table III. Crude oil output in 1953 totalled 39.4 million barrels. The major oil producers in Colombia are: The Empresa Colombiana de Petroleos, with 30.5 percent of production, which operates the De Mares property that reverted to the government in August 1951; Shell, which has three producing properties, Yondo, Cantagallo and Dificil, for a total of 45,788 b/d or 40 percent of the total; and Colpet (Socony-Texas), obtaining 28,743 b/d from the Barco, or 25 percent. These three operators produce 95.5 percent of Colombia's total oil output. Texas, as mentioned, is expected to step up its production to some 25,000 b/d upon completion of the pipe line to connect with the Andian common carrier.

Intercol is carrying out an exploration and development drilling program in the Aguachica and Totumal blocks. In the former, six wells had been completed by

TABLE I

OIL COMPANIES OF COLOMBIA

(As of June 1954)

Empresa Colombiana de Petroleos (Ecopetrol)
(Colombia Government). Operates De Mares, which reverted to the government in August, 1951; produces currently 33,300 b/d; pays no taxes. Building $44 million refinery at Barranca to be leased to Intercol.

International Petroleum Co. (Colombia) Ltd. (Intercol)
(Standard Oil Co. of N.J.). Holds 12 properties in concession for exploration and development; operates the Barranca 30,000 b/d refinery leased from Ecopetrol; also 5,000 b/d topping plant at La Dorada. Will build 25,000 b/d refinery on Colombia Caribbean coast soon; holds interest in Andian National Corp; Cia. Colombiana de Gas, LPGas marketer; also in Esso Colombiana S.A., oil products marketer.

Concesionaria de Petroleo Shell-Condor S.A. (Shell)
(Royal Dutch/Shell Group). Holds 10 exploration and development concessions; operates Yondo, Cantagallo, Dificil producing properties; 45,338 b/d in June; largest oil producer in Colombia; imports and markets specialty and lube products.

Texas Petroleum Co. (Texas)
(The Texas Co.). Holds eight properties, one fee and seven concessions; produces some 5,000 b/d from fee property which will be stepped up to 25,000 b/d upon completion of 119 mile, 12-inch crude line connecting with Andian common carrier; produces 1,000 b/d from Ortega block; refines in small topping plant and sells locally; markets imported specialty and lube products and oil products of Colpet in the Cucuta area; in 1955 will become a major oil producer in Colombia.

Richmond Petroleum Co. (Richmond)
(Standard Oil Co. of Calif.). Holds two concessions in Choco-Pacific area and two percent overriding royalty in Intercol's Aguachica and Totumal blocks now under exploration and development; completed Colombia's deepest wild cat to 15,528 feet, abandoned as of July 21, 1954.

Colombian Petroleum Co. (Colpet)
(Socony-Texas 50-50). Operates the Barco concession, 28,700 b/d production; 2,200 b/d topping plant; 60 million cu. ft. day gas plant; holds Las Mercedes block where wildcatting will be starting soon; sells oil products in Cucuta area through Texaco dealers; exported $24,518,247 in 1953.

Socony Vacuum Oil Co. of Colombia (Socony)
(Socony Vacuum Oil Co. Inc.). Holds six oil concessions and some joint venture properties; expects to wildcat in 1955; has been active in exploration.

South American Gulf Oil Co. (Sagoc)
(Socony-Texas 50-50). Operates the 261 mile 12-inch pipe line transporting Barco crude to Convenas export terminal.

Andian National Corp. (Andian)
Operates the 335-mile common carrier, capacity 70,000 b/d in mid-Magdalena Valley.

Esso Colombiana S.A. (Esso)
Largest marketer of oil products in Colombia; owned 91.5 percent by Intercol and 8.5 percent by Colombian public; has offered to sell up to 40 percent of total shares to Colombian public; controls 739 service stations; operates through lessees on their own.

Shell Colombiana S.A. (Shellcol)
Being organized to take over marketing for Shell interests in Colombia, now carried out by Cia. de Petroleo Shell de Colombia; will have 10 super service stations.

Cia. Colombiana de Gas S.A. (Colgas)
(Intercol and Colombiana). Only marketer of LPGas in Colombia, organized November, 1946; company organized by Intercol with Colombian shareholders; expect to double distribution when new refinery at Barranca supplies more LPGas.

May 31, and in Totumal, a total of nine wells have been drilled. The latest in this block, Reses, was taken down to 10,685 feet and is now being tested.

From the data of Table III, as may be seen, a total of 623 million barrels have been produced in Colombia since 1921 and today's reserves are placed on the order of 482 million barrels. This means that 1.1 billion barrels of oil have been discovered so far in Colombia through the drilling of 2,362 wells in the producing properties and 211 wells outside of these properties. The area proved up so far is indicated as 43,931 acres, distributed among the properties and operators as shown in Table III. The major producing properties have yielded oil in large quantities. The De Mares property has produced 446 million barrels of oil and still holds at least 120 million barrels. The Barco, 261 miles inland, which started pipe line shipments in 1939, has produced 93 million barrels with more than an equal amount still to be produced, estimated at some 126 million barrels. Shell's Yondo property has yielded 73 million barrels with 127 million remaining, making a total of 200 million barrels for the Casabe field.

An operator in Colombia must aim at discovering and producing at least 100 million barrels of oil within 20 to 30 years; otherwise the venture will not be economical. In the United States a major field is held to be one of some 20 million barrels of oil or more, but abroad it must be at least five times as large in view of the greater risks and greater oil exploration and development expenses involved. These considerations must be compensated by lower cost oil, favorable oil and tax legislation and an encouraging official oil policy, all of which are found in Colombia.

It is interesting to note that of 623 million barrels produced in Colombia, 528 million have been exported, bringing $823 million or an average of $1.56 per barrel fob export terminal, which may be compared to the current price of $2.38. The price movement adds an additional and significant risk in developing oil abroad.

Currently there are 19 rigs in operation in Colombia. During 1953 a total of 152 wells were spudded in and 155 completed with a total footage of 769,376 feet. Oil exports last year amounted to 32,068,989 barrels which sold fob Colombia ports for $76,294,593 or an average of $2,379. Colombian crude oil prices follow the Gulf Coast price movement and the fob export price is comparable to the posted field prices in the United States. However, the export price must cover not only the production costs, but also the pipe line transportation to seaboard, which for mid-Magdalena Valley production amounts to around 39 cents per barrel.

During the current year, Colombia will represent a $76 million market for oil goods and services. This includes the investments being made in the Barranca refinery, the crude and products pipe lines under construction and the exploration and development program. This sum just equals the value of oil exports. For 1955 the oil industry will invest a comparable sum, most of which represents purchases of goods in the United States. The oil industry sold to the central bank in 1953 a total of $32,288,557 and for the first six months of 1954 the total amounts to $18,416,161 which on an annual basis shows a 13.8 percent increase over 1953. Other capital is also finding an investment field in Colombia and other industries sold to the Banco de la Republica $9.5 million in 1953 and for the first six months of 1954 the total is $13,692,970. Sears Roebuck & Co., for instance, which has been establishing stores in Brazil and Venezuela, has just opened its second store in Colombia at Bogota, representing some $4.4 million, not including the investment already made at the store in Barranquilla. The bullish outlook for the development of Colombia is evidenced not only by oil investments, but also by the investments being made by Colombians and others. A remarkable transformation has taken place in the business section of Bogota during the past few years and progress is being witnessed everywhere throughout the country.

The rise in the price of coffee which has led to sensational press reports in the United States has been favorable to Colombia and has stimulated the economic and industrial activities of the country. Coffee brought to Colombia in 1952 a total of $380 million, in 1953 it reached $482 million, and for 1954 it is expected to bring $580 million.

TABLE II

Acreage Holdings By Operators in Colombia
as of June 30, 1954

Group or Firm	Number of Properties	Total Hectares	Acre. Equiv. Hectare= 2.47 acres
	—Producing Properties—		
Ecopetrol (Govt.)	1	512,000	1,264,640
Colpet (Socony-Texas)	1	186,805	461,408
Shell	3	113,971	281,508
Texas	2	176,889	436,916
	— Producing-Testing —		
Intercol (SONJ)	2	99,858	246,649
Sub-total	9	1,089,523	2,691,121
	— Exploration Properties — (Concessions)		
Intercol (SONJ)	12	416,992	1,029,970
Shell	7	292,634	722,805
Texas	6	251,989	622,413
Socony	6	274,816	678,795
Colpet (Soc-Tx)	1	49,996	123,490
Richmond (SOCal.)	2	97,336	240,419
Independents (Guiberson)	1	15,108	37,317
Sub-total	35	1,398,871	3,455,209
Grand Total Colombia	44	2,488,394	6,146,330

TABLE III

Summary of Crude Oil-Reserves-Acreage-Wells Drilled in Colombia
By Properties as of December 31, 1953

Properties	Crude Production June 1954 b/d	Crude Production Average 1953 b/d	Condensate Production June 1954 b/d	Condensate Production Average 1953 b/d	Cumulative Crude Oil Output Mill. Bbls.	Estimated Reserves Mill. Bbls.	Proved Acreage	Total Wells Drilled	Well Producing
Ecopetrol (Government)	32,621	34,348	2,339	2,339	445.85	120.00	18,685	1,467	1,078
Colpet Barco	28,743	25,565	....	....	92.99	126.00	15,400	374	207
Shell Yonda	42,057	40,670	....	....	72.59	127.41	4,250	395	357
Shell Cantagallo	2,196	1,530	....	....	2.59	7.00	445	21	9
Shell Dificil	1,085	1,127	....	....	5.05	0.79	2,580	29	11
Texas Teran G.	5,321	4,346	....	....	4.12	100.00	2,250	50	9
Texas Tetuan	914	292	....	....	0.11	0.75	221	14	4
Intercol Aguachica	548	130	....	....	0.04	....	....	4	1
Intercol Totumal	....	31	....	....	0.03	....	....	8	1
Total Colombia	113,485	108,089	2,339	2,339	623.37	481.95	43,831	2,362*	1,677

*Other wells drilled in Colombia from 1921 to December 31, 1953: 211.

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Road building and planting have provided an attractive setting for oil company workers in Bahrain.

BAHRAIN Petroleum Co. Ltd.

THE ORIGINAL CONCESSION for oil exploration in the Shaikdom of Bahrain in the Persian Gulf, off the eastern shore of Arabia, was granted to the Eastern and General Syndicate in 1925. It was assigned to Eastern Gulf Oil Company, a subsidiary of Gulf Oil Corporation, in 1927. As that company became a member of the American group that acquired an interest in the Iraq Petroleum Co. Ltd., it was prevented under the Red Line agreement from developing the concession and transferred it to the Standard Oil Company of California in 1928.

Bahrain Petroleum Co. Ltd. was incorporated in Canada January 11, 1929. Formal assignment of the concession to that company by the Shaikh of Bahrain was concluded in 1930.

Exploration was begun by BAPCO directly after confirmation of its title, and oil was discovered in 1932 at a depth of about 2,500 feet.

By agreement signed in 1934, a lease was granted to the company covering 100,000 acres to run for a period of 55 years. In 1940 this was amended to extend the area and to run for 55 years from that date.

In 1936 the California Texas Oil Co. of California was organized under the joint ownership of Standard Oil Co. of California and The Texas Company. Control of the producing and marketing interests of the two owning interests throughout the Eastern Hemisphere were assigned to the new organization and the Bahrain company became a part of the Caltex group.

The Bahrain main pays are included in the Bahrain zone (Cretaceous) at depths of 2,000-2,500 feet. The Bahrain fourth pay (Jurassic), depth 4,500 feet, is also being produced from a few wells. The total number of wells drilled in Bahrain stands at 122. Of this total, approximately 90 are now producing oil and the production for the field averages 30,000 barrels per day.

The Bahrain refinery was completed in 1936 for a daily capacity of 10,000-12,000 barrels and has been enlarged to a capacity of 186,500 b/d, but crude considerably in excess of the rated figures has been run. The refinery processes the output of the Bahrain field and obtains additional crude from Saudi Arabia via a 34-mile long Arabia-Bahrain pipe line. The refinery manufactures motor gasoline, distillates, diesel oils, fuel and asphalt. The products are distributed in Europe, Africa, Asia and Australasia.

In 1952 a revised agreement covering the division of income between the government and the oil company was put into effect. By decree promulgated by Shaikh Sulman bid Hamad al Khalifah, ruler of Bahrain, and accepted by the company, a tax of 50 percent was levied on the income of companies engaged in the production of oil. The tax was made effective from the beginning of 1952. This 50-50 division of income is now in effect in practically all parts of the Middle East. The agreement applies to all lands, waters and submerged lands under the Shaikh's dominion.

Crude production in Bahrain from the time of discovery to the end of 1953 is shown in the following table, the figures being in barrels of 42 U.S. gallons:

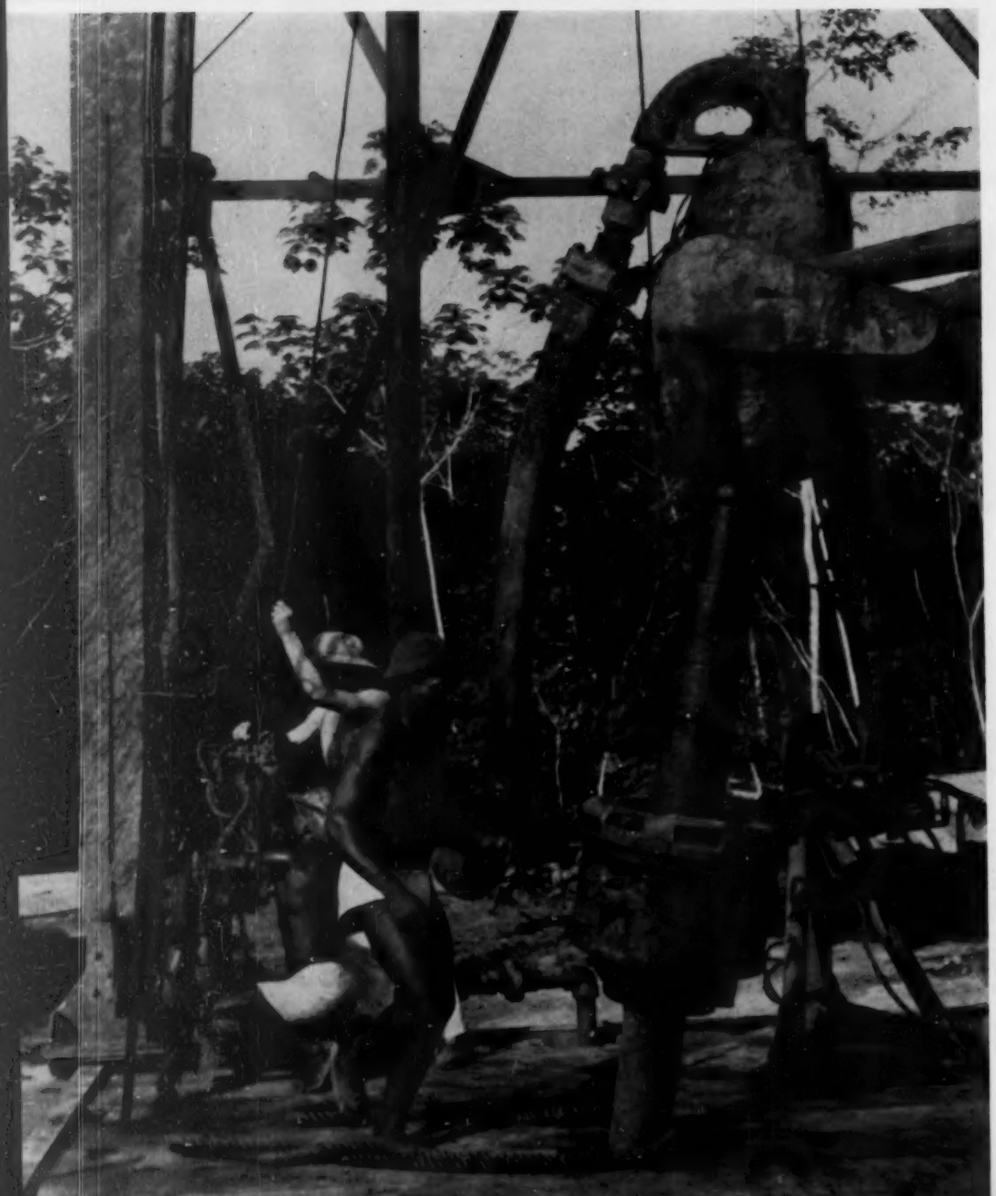
YEAR	YEARLY PRODUCTION	AVERAGE PER DAY
1932	902	...
1933	31,376	86
1934	285,072	781
1935	1,264,808	3,465
1936	4,644,635	12,690
1937	7,762,264	21,266
1938	8,297,998	22,734
1939	7,588,554	20,791
1940	7,073,919	19,328
1941	6,794,157	18,614
1942	6,240,627	17,098
1943	6,571,609	18,004
1944	6,713,795	18,344
1945	7,308,938	20,024
1946	8,009,802	21,945
1947	9,410,710	25,783
1948	10,914,905	29,822
1949	10,985,484	30,097
1950	11,015,711	30,180
1951	10,994,344	30,121
1952	11,004,278	30,066
1953	10,978,351	30,078
Total	153,892,239	

As the pioneer operating oil company on the Arabian peninsula, BAPCO has been in the forefront in the creation of an attractive environment for its employees through the provision of modern housing, health and insurance services and recreational facilities. The company provides liberal vacations and maintains benefit plans to protect workers in the case of illness, accident or disability. A thrift plan supported by joint contributions of the company and employees encourages savings. Employees are aided in building or improving homes through a housing loan plan. The committees managing these beneficial projects all have a majority of Bahrainis in their membership.

Technical training is provided for young men to fit them for responsible positions. Bahrain nationals far outnumber any other group among the operating personnel. In the refinery many skilled tasks are in the hands of native Bahrainis and throughout the organization a spirit of close cooperation exists between the management of the company and the Bahrainis, who show themselves both apt and anxious to acquire skills.

Search for petroleum production extends throughout French Union

By J. Ed. Pellissier



IN THE EARLY DAYS of the oil industry, France exhibited slight interest in the search for petroleum although its one small field at Pechelbronn dates back to the middle of the eighteenth century, and since 1815 has produced about 24 million barrels. Possibly the lack of initiative on the part of the French during the early period of the oil industry's commercial development may have been due to the prolific discoveries made in the United States, Russia and elsewhere and to the feeling of French capitalists that it was more profitable to invest in outside companies than to undertake the search for oil at home. It may have been influenced also by the fact that seepages or other surface indications of oil were not numerous in France.

At all events, France was satisfied to purchase its growing requirements of petroleum from outside and that situation remained up to the time of World War I. That conflict so clearly demonstrated the vital importance of oil in military operations, that following its conclusion the French government adopted a program for building up a strong refining industry, supporting the change by modifying its customs regulations to favor the import of crude oil rather than manufactured products. The trend in this direction was strengthened by French participation through the Compagnie Francaise des Petroles as intermediary in the Iraq Petroleum Co., giving France 23.75 percent of Iraq's crude output following the completion of that company's first pipe line in 1934.

During the thirties, therefore, the international oil companies engaged in marketing in France found it advisable to erect processing plants within the country so that before the start of the second global war, France was equipped with a modern and well organized refining plant. In the first half of the decade, about the only activities in the field of oil search and production were those of Societe de Pechelbronn in Alsace and Societe Cherifienne des Petroles in Morocco, whose first success was attained at Tselfat in 1934.

The beginning of a real exploration program in France took shape in 1937. After the discovery in 1939 of the important natural gas field at St. Marcet at the foot of the Pyrenees, exploration was extended to the Aquitaine through the formation in 1939 of a governmental organization, Regie Autonome des Petroles (RAP), and in 1941, of the Societe Nationale des Petroles d'Aquitaine (SNPA).

Spudding a hole in Gabun, French Equatorial Africa.

The Pechelbronn Co., which had lost control of its Alsace properties with the beginning of German occupation, made use of its remaining drilling equipment, first in the region of the Pyrenees, then in Languedoc through an affiliated company which became in 1944 the Societe Nationale des Petroles du Languedoc Mediterraneen (SNPLM). During the period of German occupation, work had to be carried on with circumspection, but after the French liberation the government decided to establish a systematic plan of exploration, an enterprise requiring skilled technicians and considerable financial means, both difficult to obtain in a country impoverished by war and enemy occupation.

With a view to coordinating oil search and to help in financing it, the Bureau de Recherches de Petrole (BRP), a governmental organization under control of the Ministry of Industry and Commerce, was created in 1945.

In addition to companies existing before the war and to the SNPA and SNPLM, the following companies were formed: Societe Nationale de Recherches et d'Exploitation des Petroles en Algerie (1946); Societe de Recherches et d'Exploitation des Petroles en Tunisie (1949); Societe des Petroles d'Afrique Equatoriale Francaise (1949); Societe des Petroles de Madagascar (1950); Societe des Petroles de la Garonne (1951); Societe de Recherches et d'Exploitation des Petroles du Cameroun (1951); Societe de Recherches et d'Exploitation de Petrole en Nouvelle-Caledonie (1952); Societe de Prospection et d'Exploitation Petrolieres en Alsace (1953); and Compagnie Francaise des Petroles (Algerie), (1953).

In 1949, two foreign companies, The American Gulf Oil Corp. and the Royal Dutch/Shell Oil Co., established under Tunisian legislation and with the partnership of the Societe de Recherches et d'Exploitation des Petroles en Tunisie (the former) and the Societe Nord-Africaine des Petroles (the latter) the Compagnie des Petroles de Tunisie. Standard Francaise des Petroles, the denomination of which has since then become Esso Standard, obtained in 1951 a research permit in the Bordeaux district. Finally, two companies, the Compagnie des Petroles d'Algerie (in which Shell holds a majority interest) and the Compagnie de Recherches et d'Exploitation de Petrole au Sahara (in which the Regie Autonome des Petroles (RAP) holds a majority interest), were incorporated in 1953.

This list of companies is sufficient proof of the considerable effort carried on during the past eight years with a view to organizing oil exploration in continental France, in North Africa and in French overseas possessions and territories.

By 1953 this effort resulted in the production of four million barrels of oil and 8,830 million cubic feet of natural gas, a production which is low as compared with leading oil producing countries, but is likely to expand from now on.

The natural gas production of the Regie Autonome des Petroles (RAP) from its St. Marcet field is now 8,829 million cubic feet per year. After recovery of natural gasoline, butane and propane, the gas is transported to consumption centers by a 500 mile pipe line network which connects the St. Marcet field with such cities as Toulouse, Bordeaux, Pau and various other industrial centers. The RAP, owing to its technical facilities and financial means, plays an increasingly important part in the search for hydrocarbons, not only in the region of the Pyrenees, but in Jura, in Bresse, in Savoy, in the Paris basin, and also in North Africa, where it is actively engaged in exploration work in the Sahara.

Exploration activities of the Societe Nationale des Petroles d'Aquitaine (SNPA) resulted in the discovery, at moderate depth, at the end of 1949, of the Lacq field (near Pau), the production of which reached in 1953 the level of 5,800 b/d, which corresponds to a normal exploitation of the field. The total 1953 production was 2,100,000 barrels.

In the Lacq field, test drilling for the exploration of subjacent structures resulted at the end of 1951 in a violent gas blow-out which was difficult to overcome; two more exploratory wells were then sunk in order to check the existence of this new lower field. Both struck the productive level. Production tests made in November 1951 on one of these wells evidenced a potential daily production of 5,300,000 cubic feet of natural gas containing 17 percent of hydrogen sulfide and a variety of hydrocarbons with a 93.5 percent methane content. The drilling of two other wells will permit further exploration of the field.

If the high hydrogen sulfide content raises a difficult corrosion problem, which is likely to be solved in the near future by SNPA technicians, it offers on the other hand the interesting prospect of a sulfur production, the yield of which would be around 240 gr. per cubic meter.

The program for the exploitation of the field includes the construction of two plants, one for the extraction of sulfur and the other for gasoline stripping. Meanwhile, the SNPA continues the survey of the western part of its permit and has begun the survey of another research permit in Lorraine.

In the eastern part of Aquitaine, exploration is being conducted by the Societe des Petroles de la Garonne in which RAP and SNPA each hold a 50

Drilling in the Sahara at Taoudroro-Kola, 80 kilometers east of Toh'rit on the western border of Egypt.

In 1952 this Emsco rig, drilling on the El Biod structure in the Chelif Basin, broke the record for depth outside the U. S. by going down 4,304 meters.

percent interest. Wildcats sunk in Languedoc by the Societe Nationale des Petroles du Languedoc Mediterraneen (SNPLM) total about 350,000 feet without any proof so far of the existence of a commercially profitable field.

SNPLM continues exploration in western Camargue (west of the delta of the Rhone) which has yielded a small local production since 1951 and has begun surveys of other regions, particularly Alsace.

Exploration work is being carried on by the Pechelbronn Co. on its Lower Alsace field, north of Strasbourg. Present production now amounts to about 347,000 b/a. In addition to development drilling, wildcats are being sunk for the exploration of new structures as there were some favorable indications along the Rhine.

Surveying and test drilling are carried out in middle Alsace by the Societe de Prospection et d'Exploitation Petrolieres en Alsace (PREPA) in which Pechelbronn, the Bureau de Recherches de Petrole, the Potasses d'Alsace group and the SNPLM, among others, hold interests. PREPA also intensified its exploration work in Upper Alsace since the discovery in November 1951 at Staffefelden, near Mulhausen, of an oil field lying under the potash basin, where six wells yield 810 b/d of an excellent crude.

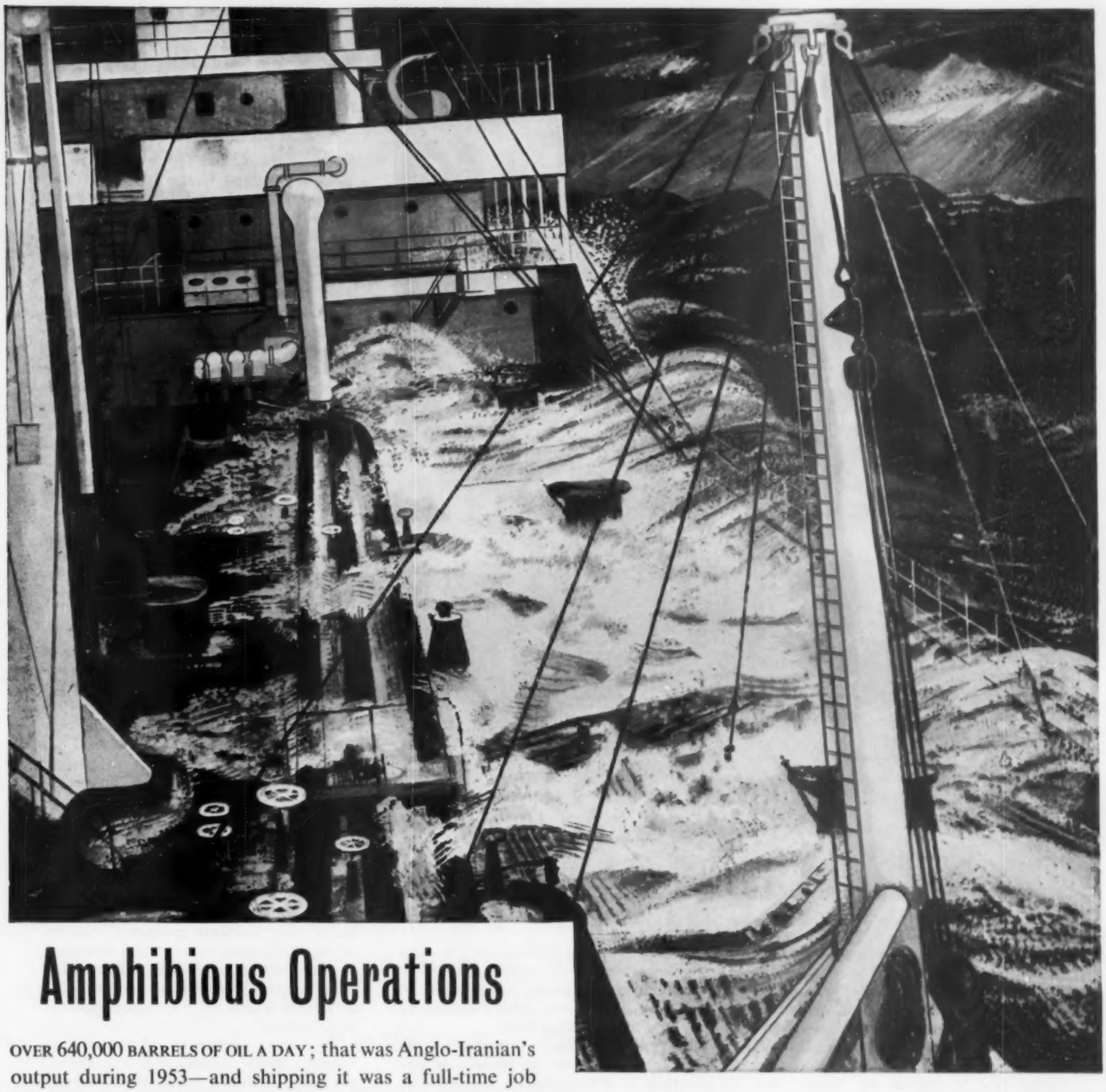
Esso Standard, after important geological and geophysical surveys on its research permit covering a large area in the Bordeaux region, started exploratory drilling in 1953. A wildcat at Parentis revealed the existence, in April 1954, of an oil bed which may prove to be of great importance.

In Algeria, where sedimentary formations cover almost three quarters of the country, a widespread survey of the areas where the existence of petroleum reserves is most probable was begun in 1941 and drew special attention to the basins of Chelif, Mitidja and Hodna, located on the northern border of the High Plateaux, eastern part of the Constantine district and Sahara area.

The Societe Nationale de Recherches et d'Exploitation des Petroles en Algerie (SNREPAL) discovered at moderate depth, in the Sidi Aissa region, within the limits of a research permit granted to Societe des Petroles d'Aumale (in which it has a 50 percent interest) a field the daily production of which increased from 184 barrels at the beginning of 1952 to about 1,840 barrels at the end of 1953. During the course of 1953, total production amounted to 640,000 barrels.

SNREPAL is carrying on an extensive exploration program in the Sahara (Colomb-Bechar district) and over a 30,800,000 acre area which follows closely the limits of a research permit covering about the same space granted to the Compagnie Francaise des Petroles. The boundaries of these research permits are roughly from Biskra to El Golea in the south, and from Figuig in the west to the south Tunisian frontier in the east. Deep drilling is under way in the Oued Raharbi, Timimoun and El Golea districts.

Further south, in the middle of the



Amphibious Operations

OVER 640,000 BARRELS OF OIL A DAY; that was Anglo-Iranian's output during 1953—and shipping it was a full-time job for the 7,000 officers and men of the British Tanker Company, shipping organisation of Anglo-Iranian. These men operate one of the world's largest privately-owned fleets.

While the ships of this fleet crossed and re-crossed the world, Anglo-Iranian prospectors were searching for more oil in desert lands, tropical jungles, and beneath the seabed itself. In the Middle East at Aden, and at Kwinana in Australia, two important new refineries were building, to join the twelve others already in operation in seven different countries.

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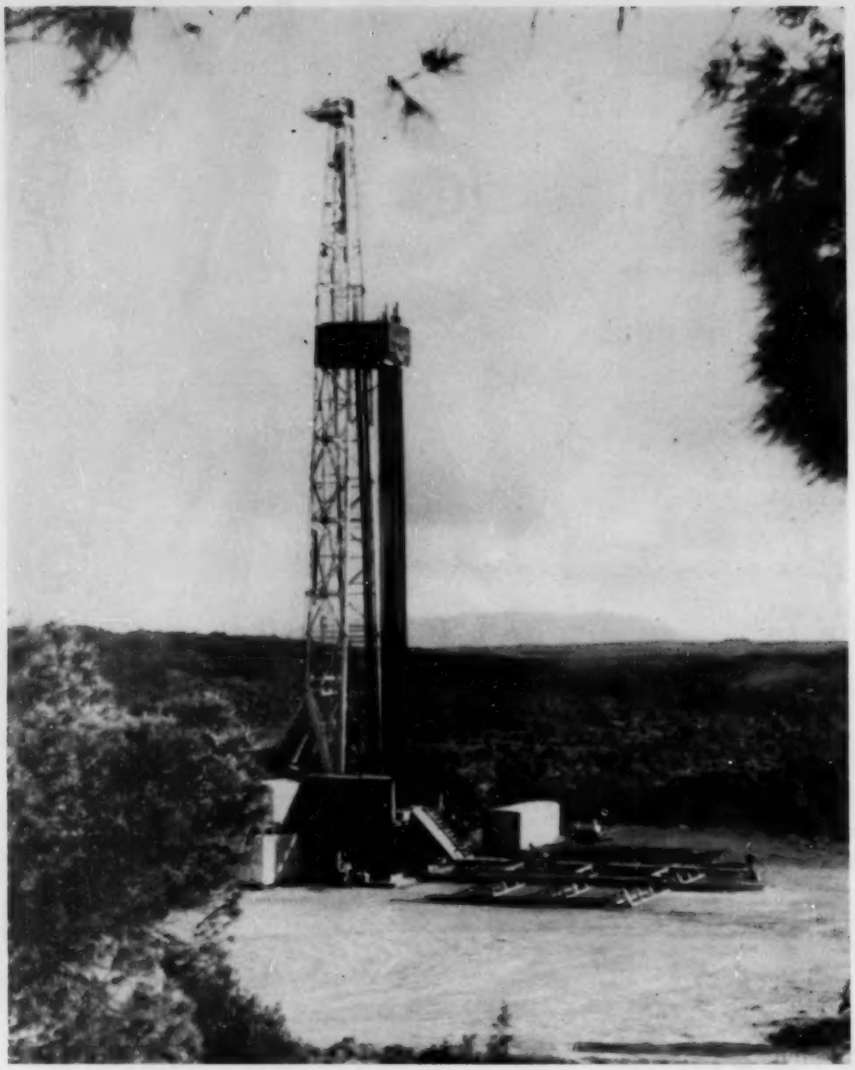

Watson rig at Oued Bahloul in the Oihtar district, Tunisia.

Sahara, the Compagnie des Petroles d'Algerie, an affiliate of Shell, and the Compagnie de Recherches et d'Exploitation de Petrole au Sahara, an affiliate of Regie Autonome des Petroles, are undertaking a survey of a 39,500,000 acre area located between the western and eastern Grand Erg, as regards the former, and on a 35,900,000 acre zone between Adrar and Tripolitan border, north of the Ahaggar mountains, as regards the latter. An exploratory well was sunk in the In Salah region. A heavy gas blow-out occurred in March 1954 which would tend to indicate the existence of hydrocarbons in the Saharian substratum.

In Morocco the search for oil is being conducted by the Societe Cherifienne des Petroles, principally in the Rharb and in the Pre-Rif. The productive structure, at the present time, is primarily that of Oued Beth, where discoveries of oil have succeeded one another regularly since 1949. Total production of all Moroccan fields is gradually increasing, and rose to 766,500 barrels in 1953, as against 286,000 in 1950. This production, which now represents from 12 to 15 percent of Moroccan consumption, is processed at the Petitjean refinery, where a catalytic cracking unit is being built.

In Tunisia exploratory wells sunk in 1949 at Cap Bon by the Societe de Recherches et d'Exploitation des Petroles en Tunisie (SEREPT) struck a natural gas field, the production of which will meet the gas needs of the city of Tunis for the next ten or 15 years. The pipe line from the field to Tunis is about to be completed. SEREPT also is carrying out test drilling in the northeast and in the center of Tunisia. In this latter region, gas and traces of oil were found in several places.

In addition to SEREPT, two companies in which foreign groups have majority interests, the Compagnie des Petroles de Tunisie, an affiliate of Shell, and the Societe Nord-Africaine des Petroles, an affiliate of Gulf, are carrying out exploration work within their concessions which for the former are located in the north of Sahel, and for the latter in the Sfax region and in the islands of Kerkennah and Djerba. SEREPT holds a 35 percent interest in both of these companies.

Traces of oil have been found for many years in the double Gabon basin, the area of which is 12,500,000 acres. In 1949, the Societe des Petroles d'Afrique Equatoriale Francaise, which replaced an exploration syndicate formed in 1944, located favorable structures within the coastal basin. In the eastern basin, on the Ogoue river banks near Lambarene, the town of Doctor Schweizer, a wildcat well yielded a small quantity of oil from sandstone structures.

Geophysical surveys and test drilling are being actively carried out.

The Societe de Recherches et d'Exploitation des Petroles du Cameroun, formed in 1951, has already conducted, east of the city of Douala, two test drilling campaigns and one of the test wells struck natural gas.

In Madagascar, the western part of the island includes over 43 million acres of sedimentary structures where asphalt impregnations similar to those of Athabaska in Canada were identified long ago. Previous exploration activities have now been taken over by the Societe des Petroles de Madagascar.

In French West Africa a Bureau of Recherches de Petrole pre-survey mission began research in 1952. The geological, gravimetric and seismic prospection includes the Ivory coast and also the Senegal and Niger basins.

To complete the picture of oil research in the French Union, mention should be made that previous geological surveys in New Caledonia entailed the formation in July 1952 of the Societe de Recherches et d'Exploitation de Petrole en Nouvelle-Caledonie which has not begun exploratory drilling.

This short survey of oil research in France, North Africa and the French overseas territories shows that headway was made during the last eight years.

France, during the period following the world war, has succeeded in building up an oil exploration industry which includes important organizations and companies, the staff and equipment of which are up to international standards.

This effort is bearing fruit, as oil fields have been and are being discovered in Aquitaine, Alsace, Morocco, Algeria and Tunisia. In 1954 a stage of further development has been reached, as legal provisions enforced in 1953, one of which is similar to the American depletion allowance, promote investments of private capital, and may in future increase the financial means of oil exploration and producing companies.

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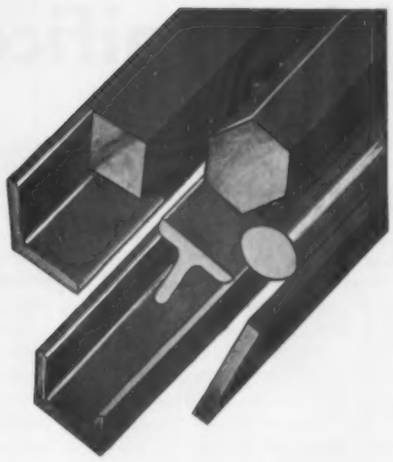

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PARENTIS discovery held significant

AN EVENT HAILED as having special significance in the search for oil in the continental area of France occurred on March 13, 1954, when the drill in a well at Parentis-en-Born, near the Bay of Biscarosse, following earlier showings of oil at 7,300 feet, penetrated a pay horizon between 7,382 and 7,428 feet. From this horizon there was obtained a crude of excellent quality with a high yield of gasoline and a low content of sulfur with a flow on test through a quarter-inch choke of 1,100 barrels per day with a surface pressure of 530 psi. With a half-inch choke the output was 3,370 barrels per day.

The hole has now reached a depth of 7,868 feet, where it has been halted for technical reasons due to fissured conditions. At the moment the productive zone has a thickness of 525 feet.

Meanwhile a group of tanks for storage of crude and a pipe line to Parentis station are under construction and arrangements have been made for a fleet of road tankers to transport oil to Esso Standard's refinery on the lower Seine at Port Jerome.

While the acceptable quality of Parentis crude has been demonstrated, some time will be required to determine the extent of the field and its commercial possibilities. It seems likely that the field may extend under the Biscarosse pool and it is considered probable that it may develop into the most important discovery in western Europe.

The beginning of the Parentis development goes back to February 17, 1951, when Esso Standard obtained an exclusive permit to explore for hydrocarbons in an area covering 878 communes in the departments of the Gironde, Charente-Maritime, Dordogne, Lot-et-Garonne and Landes. Following this grant, Esso Standard executed a series of geologic, gravimetric, magnetometric, telluric and seismic studies and in April 1953 began drilling on the Mano structure, 45 miles northeast of Mont de Marsan. The operation was suspended at 9,020 feet because of limitations of the equipment. The rig was then transferred to Parentis-en-Born where seismic surveys had revealed a promising structure. Later a more powerful drilling rig brought from the United States carried the well to completion.

Other drilling tests are being made at three points: Parentis 2 is about eight-tenths of a mile southeast of the discovery well; Parentis 3 is an equal distance west; and Parentis 4 is about a mile and a half north of Parentis 1.

Another well is to be put down near the village of Carcans in the vicinity of the Etang de Lacanau, about 30 miles northeast of Bordeaux, to explore a structure on which a favorable report was made some time ago. Meanwhile, geophysical surveys are going forward at a number of other points within the concession.

The significance of the Parentis discovery is not only the addition of another French oil field, perhaps the most important yet found within the national boundaries, but also its influence in stimulating applications for concessions and plans for exploration throughout the metropolitan area.

As a result of the signal success of Parentis, there has been a rush of applications for concessions to cover remaining portions of Metropolitan France. While the discovery of this new field resulted from the efforts of Esso Standard, a privately owned corporation, the general policy in awarding exploratory concessions has been to grant these to the so-called state organizations or combinations of these with private capital and this plan appears to be favored in dealing with areas not previously covered. Leases recently issued have awarded large areas to the three principal state organizations, the Regie Autonome de Petroles, the Societe Nationale des Petroles d'Aquitaine (in which the government holds a 62 percent interest), and the Societe Nationale des Petroles du Languedoc, 66 percent government owned. These companies may make combinations with private interests to develop areas within their jurisdiction. An example of this type of mixed ownership is the recently organized corporation called Fropex, formed to prospect a large area around Orleans, of which 55 percent is held by the Societe Nationale des Petroles d'Aquitaine and the remainder by American Overseas Petroleum Co., a member of the Caltex group. Other American companies are displaying interest in current field developments in France.

View of the discovery well.

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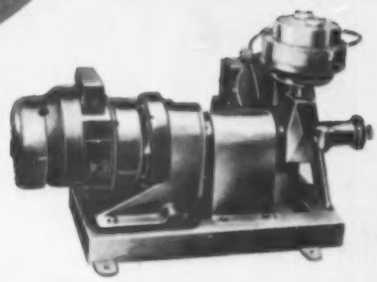

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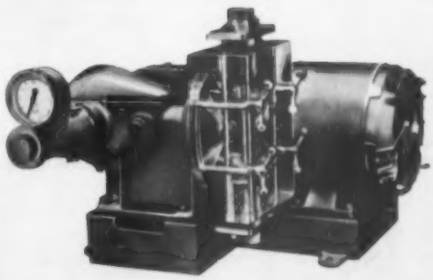

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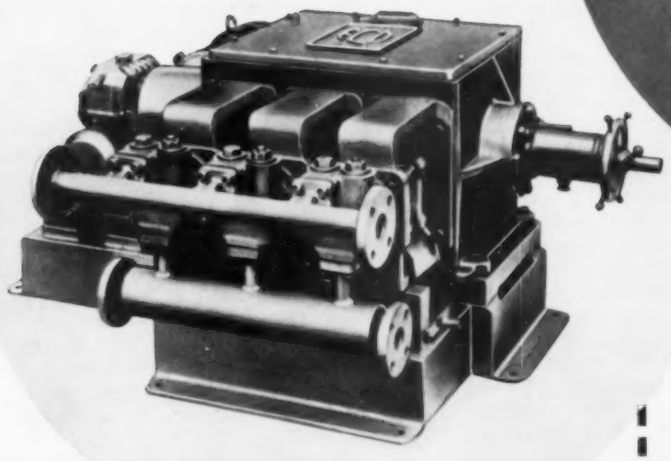

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Oil barge on the Pachitea River in eastern Peru at Ganso Azul's Aguas Calientes port.

SOUTH AMERICA increases production and expands exploration

By Dr. Juan E. Rassmuss

ALTHOUGH THE SUPPLY of petroleum has been abundant on the world markets in 1954 and production in the United States has had to be reduced, development in South America has been active and output increased in most of the South American countries.

In Venezuela, production advanced to an average of 1,868,322 b/d for the first six months of 1954 against 1,764,988 b/d in 1953, an increase of almost six percent. Granting of new concessions is expected shortly, especially in the Apure-Barinas basin, and a larger number of new applications have been prepared by the different companies now active as well as by new applicants, including a French corporation.

In Colombia, crude production, which averaged 108,029 b/d in 1953, reached a peak of 114,477 b/d in February of this year and amounted in June to 113,485 b/d, above the yield of the former year. Biggest producer was Shell's Casabe field with 45,388 b/d in June, which was followed by the government's Empresa with 32,621 b/d plus 2,339 b/d of natural gasoline, and Colombia Petroleum Co. (Socony-Texas) with 28,743 b/d. International's new fields of Totumal and Aguachica yielded only 548 b/d in June. Most noteworthy event in exploration was the wildcat of Richmond Oil Co. at Buchado in the Choco department near the Pacific coast. At the end of July, drilling in Cretaceous beds, it reached a depth of 15,539 feet, the deepest well on the Pacific coast in South America, but without oil shows. Intercol, International's Colombian subsidiary, completed a wildcat on the Atlantic coast some 15 miles south of Barranquilla to 12,525 feet depth, which remained dry.

In Ecuador, production, which amounted to 3,039,721 barrels in 1953, is staying at about 8,300 b/d, 80 percent of the output yielded by the British Anglo-Ecuadorian Oilfields Ltd. from some 1,060 wells at a rate of only about six b/d per well. The Manabi Exploration Co., which holds around 1.5 million acres on the northern coast, has not discovered any new pools and its production continues restricted to the Tigre field in the Santa Elena peninsula, acquired from Ecuador Oilfields Ltd. Output, which amounted to around 1,350 b/d in 1953, has been reduced to an average of 1,050 b/d during the first four months of 1954 from 140 wells.

Production of crude in Peru increased in the first five months of the year to 7,144,643 barrels against 6,522,508 barrels in the same period of 1953, a gain of nine percent. Including natural gasoline, production amounted to about 51,000 b/d recently. International's Brea-Parinas field yielded 904,055 barrels in May. Cia. Petrolera Lobitos fields, including the joint operation areas, produced 488,585 barrels, Empresa Petrolera Fiscal 53,329 barrels, and Ganso Azul in the Montana 35,188 barrels.

In Bolivia, production of Yacimientos Petroliferos Fiscales Bolivianos has been raised somewhat in 1954. By additional drilling in the Camiri field, which yields about 90 percent of the output, total production reached a peak of 4,979 b/d in February and averaged above 4,000 b/d in the first four months of the year. For the first time, national production exceeds domestic consumption, estimated at around 3,000 b/d, alleviating the adverse trade balance of the country. Small quantities of oil have been exported and on July 1 the Bolivian government, through its ambassador in Santiago, offered gasoline to Chile, proposing for this purpose the construction of a pipe line from Oruro to Arica on the Pacific coast.

In the McCarthy concession, the first well on the Los Monos structure, drilled to a depth of 3,459 feet, struck high gas pressure with some six barrels of high grade crude. A second well, about half a mile distant, has been spudded.

In Chile, production is continuing to rise, averaging about 4,500 b/d during the first four months of the year. A supply of about one-third of the crude required for the new 20,000 b/d refinery in Concon is potentially secured. A press despatch from Santiago announces that the Chilean government is considering the opening of the country to private oil companies, terminating the State's monopoly of oil development.

In Argentina, where production increased to an estimated figure of about 84,000 b/d, a proposal has been reported by Atlas Corp. of New York in conjunction with Dresser Industries for the formation of a company called Petro-Argentina for development of the Neuquen fields and construction of a 16-inch 400-mile pipe line from Neuquen to Bahia Blanca. The proposed contract is subject to approval by the Argentine Congress and faces the obstacles imposed by Argentine restrictions on foreign investment and exchange which apparently would have to be modified if it is to be carried through.

In Brazil, where domestic consumption is estimated at about 150,000 b/d, total output amounting to 915,840 barrels in 1953 (around 2,500 b/d) decreased slightly to 2,100-2,200 b/d in the first five months of this year. In May it was 2,058 b/d. New discoveries in the Bahia fields, and in the Amazon basin oil shows have been met in the Nova Olida well. Monopoly for exploration and development of Brazil's oil is now concentrated in the official Petrobras company.

Exploration has been active in Peru during 1954, particularly in the Sechura desert, where an area of 1,660,836 hectares is covered by the concessions of 10 companies. Concessions of Conorada Corp. have been taken over by the Union Oil Co. and concessions of Peruvian Oil Concessions, Inc. and Cia Sud Americana de Petroleo, both promoted by Argentine interests and merged later on, have been bought by Texas Petroleum Co. at a price of around $500,000 plus a royalty, reducing the former number of 12 concessionaires to 10 at present. Interna-

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INSULATING CONCRETE	REFRACTORY CONCRETE
Made with CIMENT FONDU and crushed insulating brick or lightweight aggregate.	*Made with CIMENT FONDU and crushed refractory firebrick.*
Only suitable, in general, for hot-face temperatures up to 1,000°C. (with certain special lightweight aggregates it can be used up to 1,300°C).	*Suitable for hot-face temperatures up to 1,300°C. (with certain special refractory aggregates it can be used up to 1,600°C.).*
Lightweight (30–80 lbs. per cu. ft.). Comparable to insulating brick construction.	*Heavier than insulating concrete (110–120 lbs. per cu. ft.) although somewhat lighter than firebrick construction.*
Low thermal conductivity (somewhat higher than that of insulating brick used).	*Higher thermal conductivity than insulating concrete (although lower than that of firebrick).*
Lower strength than refractory concrete (but higher than insulating brick used).	*Comparatively high strength.*

In brief "INSULATING CONCRETE" has a much greater insulating value and is much lighter in weight, but has a lower strength than Refractory Concrete. In general it is not used at such high temperatures as Refractory Concrete.
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tional acquired a 50 percent interest in the Sechura concessions of Canadian Sea Oil Ltd., subsidiary of Ventures Ltd. of Toronto.

A number of operating agreements have been closed. Richmond Oil Co. operates a development of 148,485 hectares, about half of Petrolera Peruana's concessions, located in the southeastern and eastern part of the desert. International closed an operating agreement with the national Petrolera San Miguel, which holds 10,417 hectares, and Union Oil Co. operates the concessions of Petroleo Sullana Ltda., in which a 60 percent interest is held by the Peruvian banking house of Wiese and 40 percent by Union Oil Co. of California, comprising also the former Conorada holdings with a total of 195,900 hectares.

After an extensive geophysical survey (principally seismic) last year, which seemed to indicate favorable conditions as to sedimentary thickness and convenient structures, 10 wildcats have been drilled up to July in Sechura, all remaining dry. International Petroleum Co. drilled its first well, Viru 4, southsoutheast of Paita, to a depth of 7,330 feet, hitting basement. The second well, Expectative 1, located in a concession of Sea Oil Ltd., reached the basement at 5,684 feet. The third well, Viru 5, located southeast of Viru 4 and about 12 miles west of the village La Union, is the deepest well drilled so far in Sechura and was abandoned on July 18 at 8,063 feet in basement rocks. None of them had commercial oil shows.

Richmond Oil Co. has been exploring the southern part of Sechura, locating its first well, Inca 5, at about 12 miles' distance from the southern coast of Alto Verde. The well was drilled to 5,994 feet, remaining dry in Cretaceous slates and being abandoned. The second well, Minchales, located in the interior about 22 miles to the northeast in a concession of Petrolera Peruana, struck igneous rocks at 5,792 feet without meeting any oil shows. Only a small eruption of dry methane gas occurred later on. Richmond has retired its drilling equipment temporarily and transferred it to Venezuela.

Union Oil Co. so far has drilled five wildcats in the northernmost part of Sechura, located north of the highway from Piura to Paita, but all of them struck basement at a relatively small depth and did not meet any oil shows. The first well, Paita 1, hit basement at 1,282 feet; the second, Piura 1, at 3,500 feet depth; the third, Piura 2, at 1,778 feet; Paita 2 at 3,528 feet; and the last, Paita 3, completed on July 27 at 3,419 feet depth.

Exploration drilling in Sechura has been unsuccessful so far and sedimentary thickness has been found much smaller than indicated by the geophysical surveys. New research and further drilling will be necessary to establish more exactly the conditions of this basin, which, according to the present drilling results, appears only shallow, and for locating the lower Eocene deposits which are the source bed of the oil in the northern fields.

In the northern area, east and north of the producing fields, is the concession of 870,000 hectares of Empresa Fiscal, of which a considerable acreage has been leased to Peruvian Pacific Petroleum Co., new subsidiary of Cities Service Co., and to the American Amotape Co. Peruvian Pacific drilled two exploration wells east of the El Alto field of Lobitos Co. and near the eastern border of the Lobitos concessions. The southern well, Tablazo 12-1, was abandoned in lower Eocene deposits at 5,562 feet and the second well, Tablazo 10-1, located about six miles northeast, was completed at 5,660 feet depth, remaining dry in the lower Eocene.

On the continental shelf off the Lobitos coast, Douglas Oil Co. of California has spudded three wells, deviated by inclined drilling at a 37½° angle from the shore. The first well was completed on May 24 at a total depth of 7,027 feet, corresponding to about 4,200 feet vertical depth, and yielded in the test 30 b/d of 37° API crude and 200,000 cubic feet of gas. It was temporarily shut in. The second well was suspended at a depth of 6,226 feet for changing to a stronger rig. The third well, farther south, was spudded on July 5.

All of the new exploratory wells have been drilled by contractors: International and Union wells by Santa Fe Drilling Co., which operates also one rig for Empresa Fiscal; the Richmond wells by Loffland Bros. of Tulsa; and the Douglas wells by Dunlap & Graham Drilling Co. of Long Beach, California, recently replaced by the Field Service Co. of Panama and New York, which acquired the Dunlap Co.

The disappointing results obtained so far in Sechura have increased interest in eastern Peru's Montana in the Amazon basin. The concessions granted comprise around 16.5 million acres, exceeding the total concession of Venezuela. Socony-Vacuum Oil Development Co. has augmented its large acreage by 146,994 hectares of concessions on the Callaria river, an eastern effluent of the Ucayali river, north of Pucallpa. Le Tourneau Inc. of Peru, subsidiary of the large road equipment manufacturer of Pearia, which holds a million acre land and colonization concession south of Pucallpa, has applied for 115,394 hectares of oil rights on the Pachitea river near Ganso Azul.

Ganso Azul Co., of which 80 percent is held by Texas Gulf Producing Co., is engaged in an active development program. Five new wells have been drilled in recent months and the sixth well has been spudded. One well to the west struck the edge water and no oil. The new wells have been drilled deeper to about 1,500 feet for testing lower sands and the results are reported encouraging. Production, although still limited by transport difficulties, has been increased to around 1,000 b/d, amounting last May to 35,188 barrels.

Operations will be extended to the second dome in the concession on Chonta island. A road is being constructed to the new location and a larger rig has been imported for this job. The original concession area of Ganso Azul of 30,000 hectares has been increased by 9,149 hectares of applications.

An operating agreement has been concluded with the Canadian company, Peruvian Oils & Minerals, for testing the Santa Clara dome, located further north at about 7° southern latitude on the western bank of the middle Ucayali river, south of Orellana. On this structure Empresa Petrolera Fiscal had drilled a wildcat in 1947 which had to be abandoned at less than 1,100 feet because the drill collar got stuck. A new well to 5,000 feet is now projected by Ganso Azul.

The Brazilian Companhia de Petroleo da Amazonia in Manaos has awarded a contract to the Southwestern Engineering Co. of Los Angeles for construction of a complete refinery of 5,000 b/d capacity in Manaos at a cost of four million dollars. Ganso Azul Co. has entered an agreement to supply crude to the Brazilian refinery.

The national Cia. de Petroleo El Oriente, which drilled three wildcats in the Montana, is preparing a new wildcat in the Cashiboya region, east of the Ucayali river. A camp has been constructed on the river south of Contamana and a road 20 miles in length is being built to the well site.

The Oriente Co. recently entered an agreement with a syndicate of three German oil companies for 50 percent of its large acreage, by which the German group is to drill on its own account a number of wells and after completion of this program interests and expenses are to be shared at 50-50. This agreement represents the first active participation of European interests in Peru's new oil development.

Exploration is progressing also in other parts of the prospective region. Socony Vacuum Oil Development Co. has completed an airborne magnetometer survey of its concessions and an aerial topographical survey of a big part of the northern Montana is being carried out for the account of the several companies engaged in this region, to be completed in two years. In the southern Montana, Anglo Saxon Petroleum Co. has been granted a permit for geological and geophysical surveys which already have commenced.

Texas Petroleum Co. has brought five tugs and barges from Trinidad to Iquitos on the Amazon with equipment for starting exploration of its holdings, and Richmond Oil Co. has initiated geological field work in the Montana.

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CANADA

Canadian production rises 25 percent in 1954 half year

By J. L. Irwin

While Western Canada's oil industry, extending over a vast area, has continued to meet with successful development in the first half of 1954 and once again has shown a large increase in production, exploration activities have proceeded at a slower rate since the peak was reached at the close of 1952.

This was perhaps to be expected. In the five year period following the discovery of Leduc at the beginning of 1947, the pace of development in all branches of the industry was terrific. Pipe line construction was completed to the Pacific coast and to eastern Canada; extension of established refineries and construction of new ones on a major scale appeared over a widespread area. Added to this, exploratory work in the western provinces was pushed to the limit. With the coming of maturity, this great development continues, but is moving on a more even keel.

OIL PRODUCTION BY PROVINCES

(Barrels)

	JAN. 1 TO JUNE 30, 1954	JAN. 1 TO JUNE 30, 1953
New Brunswick	6,800	7,615
Ontario	210,000	109,995
Manitoba	714,000	187,994
Saskatchewan	2,028,000	1,197,753
Alberta	39,056,000	31,721,834
Northwest Territories	216,000	157,575
Total	42,230,800	33,382,766

(*Reproduced by courtesy of the Department of Mines and Technical Surveys, Ottawa).

The 1953 figures are final, but the 1954 figures must be considered only as estimates subject to later revision when all final figures become available. However, the indicated increase of 25 percent is expected to hold.

It will be noted that in the above six provinces reporting for the first half of 1954, only New Brunswick shows a decrease. Speaking in round figures, Ontario and Saskatchewan's totals are doubled, Manitoba is quadrupled, Alberta shows an increase of around 7¼ million barrels, and the Northwest Territories an increase of about 25 percent.

A substantial growth in oil consumption is indicated by the fact that in May of the current year the daily demand in Alberta was 215,143 barrels, but buyers asked for a record volume of 276,735 barrels daily for August. Total for the second half of 1954 is expected to be well ahead of last year.

Gross value of crude oil to producers for the 1954 five month period was $82,909,816 to compare with $59,392,770 covering the same period in 1953.

Disposition of natural gas production for the five month period of 1954 includes 40,270,282 Mcf for sales in Alberta and 11,017,535 Mcf covering waste. The balance was distributed under the headings of gas stored, sales in British Columbia exports to U. S. A., plant fuel, line fuel, loss and MD, field use, and processing shrinkage.

Natural gasoline production for principal fields in barrels in 1954 was as follows: Jumping Pound, 24,455; Leduc-Woodbend, 27,925; and Turner Valley, 229,826, totalling 282,206 barrels to compare with 255,359 for the same period in 1953. Gross values of these totals to natural gasoline producers were $825,571 in 1954 and $722,740 in 1953.

Propane production totalled 108,613 barrels from Leduc-Woodbend; 69,716 from Turner Valley; and 22,737 barrels imported from U.S.A., making a total of 201,066 to compare with 158,056 in 1953.

Total production of butane for the period came to 75,640 barrels compared with 67,111 barrels last year.

Naphtha produced from Morinville totalled 3,908 barrels. Sulfur recovered from Jumping Pound came to 4,600 short tons; and from Turner Valley, 4,608 short tons, totalling 9,208 to compare with 7,494 in 1953.

Footage drilled in the first five months of 1954 came to 2,239,632 to compare with 2,438,741 in 1953. Licenses issued in 1954 totalled 455 compared with 556 in 1953.

In the first half year of 1954, 17 wells were drilled in British Columbia to compare with 29 in the half year of 1953. Of these, 10 were completed as potential gas wells this year compared with seven completed last year. As of June 30, 1954, four wells were being drilled compared with 14 on June 30, 1953. This year's footage drilled totalled 72,627 against 101,533, in 1953.

During the first half of 1954 a total of 335 permits for exploration were issued covering 22,015,003 acres to compare with 557 permits covering 33,625,608 acres in the same period of 1953. Licenses in 1954 numbered 736 (6,716,265 acres) compared with 208 (2,032,870 acres) in 1953. Leases in 1954 totalled 12 (12,565 acres), with 24 (12,565 acres) in 1953.

Before the close of 1954's half year, crude oil on a commercial basis was discovered in a well in the Fort St. John area, establishing the first oil well in the province.

In keeping with Saskatchewan's increase in oil production as shown in the first half of the current year, there comes information of a contract awarded for construction of a 260-mile pipe line in Minnesota which will form the final link between the Fosterton field in southwestern Saskatchewan and the Minnesota refinery of Great Northern Oil Comany which will process the crude. By June of next year it is expected that medium crude oil from this Saskatchewan area will be moving to Minnesota at the rate of at least 15,000 barrels a day with an anticipated 20,000 barrels daily six months later.

Out of 100 wells drilled in Manitoba during the first half of the year, 71 proved successful as producers of light crude oil, the balance being abandoned. Footage drilled totalled 251,340, of which 168,255 feet were drilled in field development and 83,085 feet in wildcat exploration.

The Virden Roselea, North Virden Roselea and Daly fields are at present outstanding among Manitoba's producers. Just after the close of the half year, the Woodnorth field added three more successes to its first established and others are drilling or projected. Average total depth of all producers in Manitoba is reported to be 2,498 feet with recoveries from the Mississippian formation.

Rejection by the Federal Power Commission in Washington of the proposal for gas export to the U. S. was a severe blow to Western Canada's oil and gas industry during the first half of the present year. Had more attention been given to the economics of this important question, and less to political aspects, it is possible that this adverse decision would not have materialized.

Buys Interest in Refinery

Royalite Oil Company Ltd. of Calgary has announced that it has purchased the 50 percent capital stock interest held by Canso Oil Producers Ltd. in Prince Albert Refineries Ltd. The company operates a 1,000-barrel refinery at Prince Albert, Saskatchewan. Royalite now has 100 percent ownership of Prince Albert, which will continue to operate under its present name as a wholly-owned subsidiary with the head office in Prince Albert, Sask. J. B. Lloyd will continue as general manager. Royalite acquired a 50 percent interest in Prince Albert Refineries in November 1952 and at that time took over direct supervision of plant operations.

Canadian Gas Line Contract Let

Rupp Ltd. of Edmonton, pipe line contractors, has been awarded the contract to build 30 miles of 10-inch pipe line linking the present Brock-Saskatoon gas line to the Coleville field in Saskatchewan. The same firm will construct a field gathering system in the Coleville area that will add 10 to 15 of the Coleville wells to the present system.

This work is being done as a result of the Conservation Board's decision that the Power Corporation could withdraw up to 30 million cubic feet of gas per day from the Coleville area.

Alberta Gas Line Plans

R. J. Dinning, a Calgary business executive, was elected chairman of the Alberta Gas Trunk Line Company's provisional board. The board has been considering all aspects of financing during its review of the several financing plans already submitted. Considerable study has been given to preliminary plans of proposed pipe line routes.

At an earlier meeting, W. F. Knode was appointed general manager. The company has opened a temporary office at 512 Eighth Avenue West, Calgary, with a small staff.

Trans Canada Pipe Line Approved

The Federal Board of Transport Commissioners of Canada has given formal approval to the application of Trans Canada Pipe Lines Ltd. to construct a natural gas pipe line from Alberta to markets in the eastern provinces. The line will be over 2,200 miles in length and is estimated to cost around $300 million. The permit enables the company to complete its financing, and construction is expected to start early in 1955.

Canadian Kellogg Vice Presidents

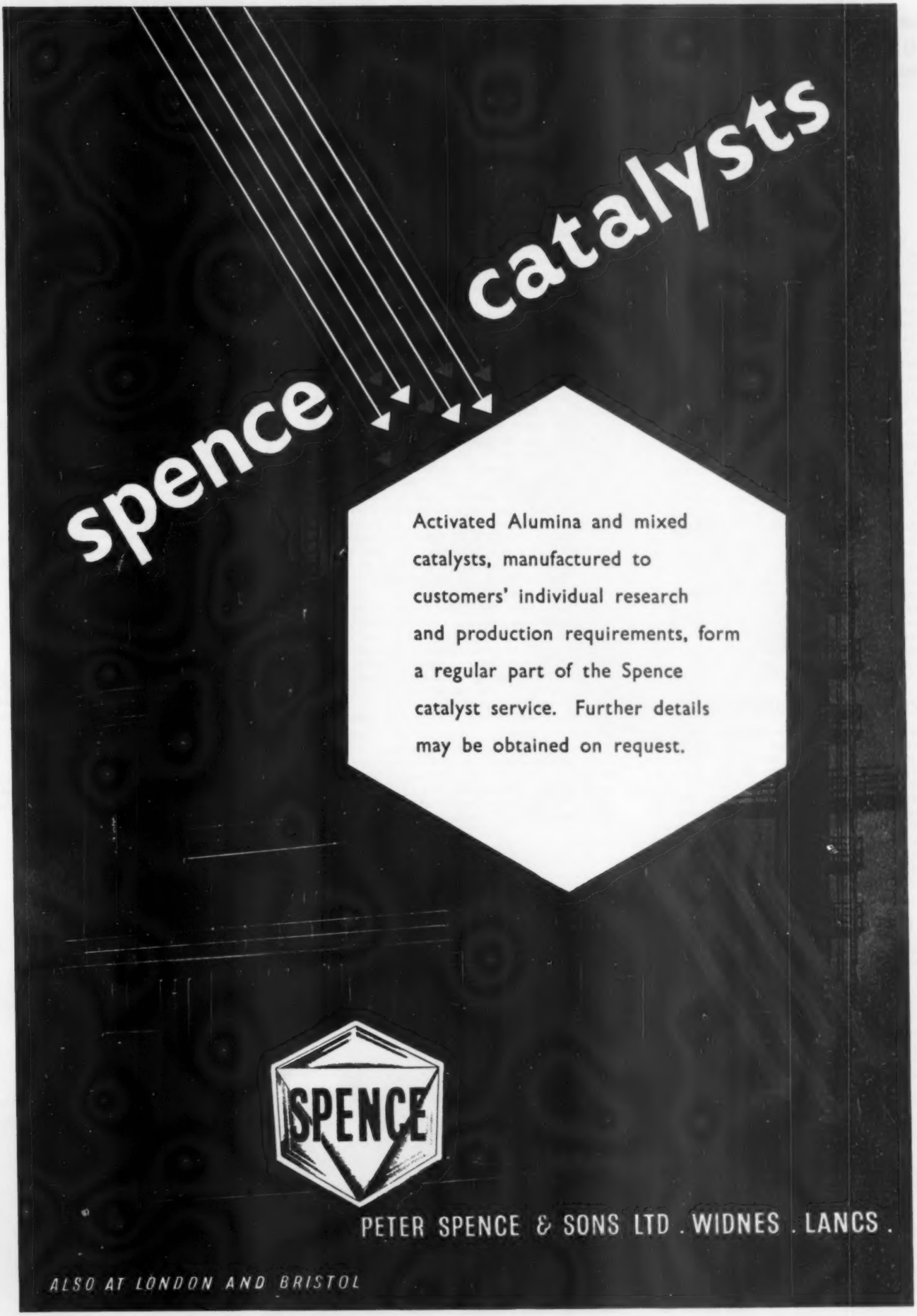
M. Joseph Carnesale and Donald W. Champlin were recently elected vice presidents of The Canadian Kellogg Company Ltd. of Toronto. Canadian Kellogg is a subsidiary of The M. W. Kellogg Co., New York.

Mr. Carnesale is responsible for the sales of petrochemical plants and oil refineries. A chemical engineering graduate of New York University, he came to The M. W. Kellogg Co. in 1944 with a background of 13 years in the petroleum refining industry.

Mr. Champlin has been a vice president of The M. W. Kellogg Co. of New York.

M. J. Carnesale

D. W. Champlin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BRITISH OIL NEWS

By E. Lawson Lomax

The one topic of absorbing interest in oil circles at the moment is, of course, the agreement signed in Teheran for settlement of the Iranian imbroglio. Interest is by no means confined to members of the petroleum industry, however. The approving statements and congratulatory messages issued by heads of states testify to the great political importance attached to the agreement which, it is hoped, will mark the close of a very disturbing period and the opening of one less critical and promising greater stability.

Many of the meetings at which the provisions of the agreement were worked out were held in London and a vast amount of thought and discussion went into evolvement of a plan reconciling wide initial differences and ultimately providing a practical means of operating the oil fields while fully protecting the essential claims of the Iranians. While there are still numerous steps to be taken before the agreement becomes legally effective, those who have been close to the proceedings seem confident that the advantages offered to Iran are so great that it should meet no obstacles on that side, while the oil companies concerned are definitely committed to it through their representatives.

Practical oil men realize, however, that there are many problems ahead in fitting a rising volume of Iranian oil into markets already fully supplied from other sources and that economic statesmanship will be needed in the execution of the agreement.

Platformer For Shell Haven

Work has begun on the construction of a Platforming unit at the Shell Haven refinery of Shell Petroleum Co. Ltd., which is scheduled for completion toward the end of 1955. Estimated cost of the plant is about £2.5 million ($7,025,000) and it is designed to produce 240,000 tons **per annum** of high octane components for blending into premium quality motor spirit. This is the second unit of this type to be built by Shell; the first came on stream at the Stanlow refinery at the end of 1953 and is producing components for aviation gasoline.

Offshore Well in Trinidad

In the Gulf of Paria, six miles from the nearest land, a well is being drilled by Trinidad Northern Areas Ltd., in which D'Arcy Exploration Co. of Anglo-Iranian Oil Co. has a one-third interest.

The drilling rig, which is capable of drilling to a depth of 6,300 feet, is mounted on a platform, 110 feet by 50 feet, resting on piles which were driven through 80 feet of mud to provide a foundation, the platform being 40 feet above water.

Oil Use for Power Generation

Britain is traditionally committed to the use of coal for power generation, but several factors are combining to bring about a shift from solid to liquid fuel for certain uses. Coal production has not kept pace with the growth of power requirements since the government took over the industry. In spite of the introduction of mechanization, output to a large extent, has lagged and prices have risen, increasing the operating costs of productive industries. With the rapid expansion of oil refining in the past few years, including the erection of new plants and the enlargement of older ones, a larger supply of fuel for steam raising from oil is available and a shift to its use is taking place.

Already the Bankside power station in London, one of the 33 which are part of the British Electricity Authority's current program of expansion, is operating on oil. The reason in that case is partly an aesthetic one; it was urged in order to abate smoke in the central part of the city. It has been announced in Parliament, however, by the Rt. Hon. Geoffrey Lloyd, Minister of Fuel and Power, that the new 300,000-kilowatt power station of the BEA at Marchwood Hampshire, is to be equipped for dual firing on oil or coal.

An agreement has been made between the Esso Petroleum Co. and the BEA for an estimated quantity of some 350,000 tons of fuel oil *per annum* to be supplied to the new station from the Fawley refinery about six miles away. Ultimately the rate of consumption could reach a figure of nearly 600,000 tons of oil, equivalent to an annual saving of about a million tons of coal, which would help to relieve that shortage.

Leonard Sinclair, chairman and managing director of Esso, said in this connection: "Because of the proximity of Fawley and Marchwood, we shall be able to supply all the oil needs of the new station at a price which will result in the operating costs being no higher than those of equivalent coal requirements."

Coastal Storage in Britain

Growth of oil refining and of the consumption of petroleum products has led to the expansion of coastal storage and installations where refined products from the refineries can be delivered to strategic points by sea and from there delivered by road or rail to garages, filling stations and smaller depots.

A new concrete jetty is being built at Queen's Dock, Swansea, to provide additional facilities for loading coastal tankers with products from Anglo-Iranian's Llandarcy refinery. This jetty will be capable of handling 15 products including motor spirit, kerosine, gas oil, lubricating oils and fuel oils. Twenty new storage tanks are being erected at a cost of about £600,000.

Installation facilities in Jersey, Channel Islands, belonging to Shell-Mex and B.P., are being improved. At present the movement of oil depends on a tidal berth in the harbor at St. Helier, where small tankers can be accommodated only for restricted periods each month according to the tides. A berth is now to be used in the outer harbor which can be approached at all states of the tide.

A new coastal depot has been opened by Shell-Mex and B. P. at Workington, Cumberland which will take the place of two older depots at Cockermouth and Carlisle. Coastal tankers berthed in the Prince of Wales dock will discharge their cargoes through 8-inch pipe lines into the tankage erected at the new depot.

Here, eight large road tankers can be loaded at the same time, at a rate of 250 to 500 gallons per minute, by motor driven centrifugal pumps controlled by push-button switches on the filling gantries.

Prospecting in Malta

Three licenses have been granted to the D'Arcy Exploration Co. by the government of Malta, giving the company the right to explore for petroleum in Malta and Gozo.

Helicopters convey men and materials over the swamps and jungle of Papua when the Australasian Petroleum Co. and Island Exploration Co., owned by British, American and Australian interests, are pushing their search for oil.

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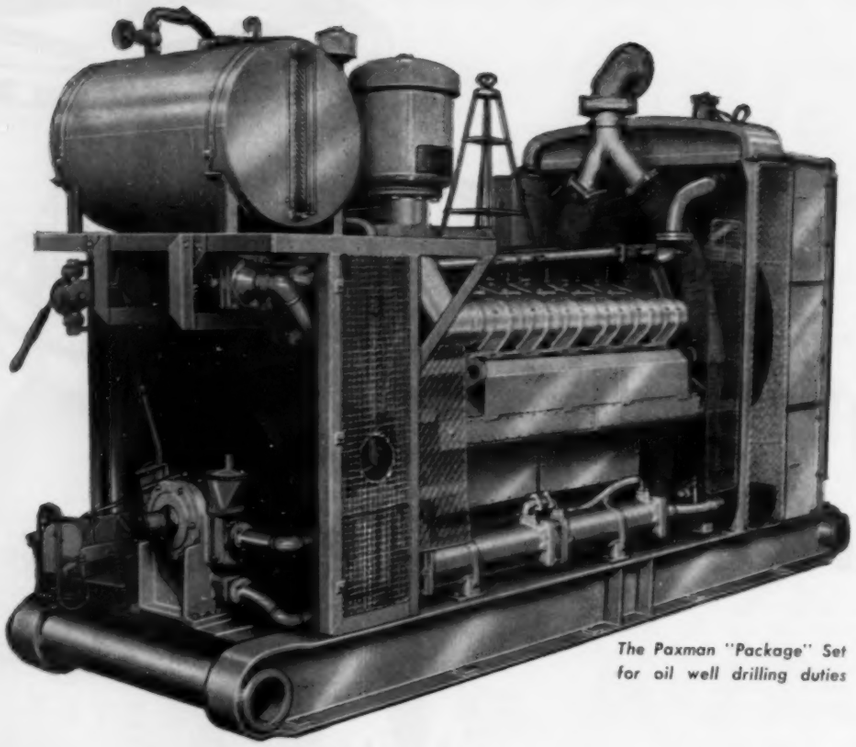

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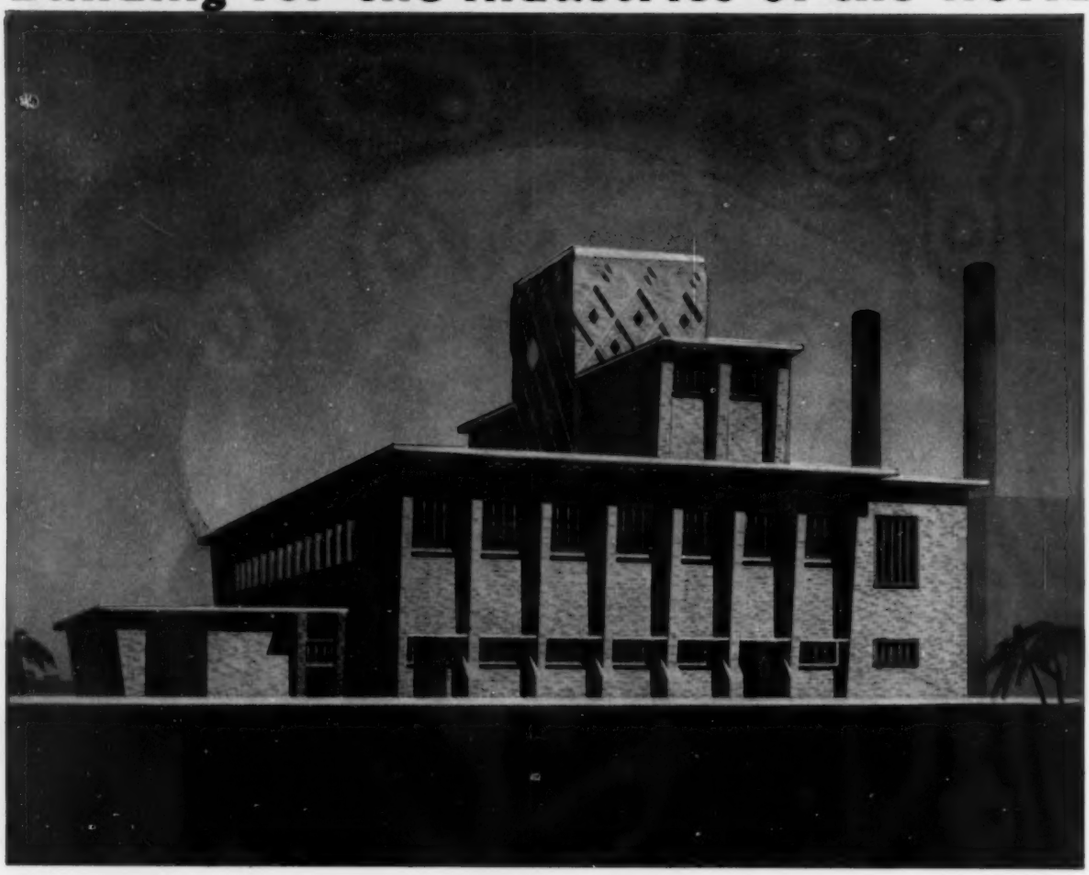

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Washington PIPE LINE

Congress and the petroleum industry

By Joseph Huttlinger

A presidential survey of energy supplies and resources, covering oil, gas and coal, is being made by a committee of six Cabinet members and the chairman of the Office of Defense Mobilization.

President Eisenhower asked for the study "to evaluate all factors pertaining to the continued development of energy supplies and resources and fuels in the United States with the aim of strengthening the national defense, providing orderly industrial growth and assuring supplies for our expanding national economy and for any future emergency."

Arthur S. Flemming, head of ODM, was named chairman of the committee by the President. Members are the Secretaries of State, Defense, Justice, Interior, Commerce and Labor. The committee, facing a deadline of December 1 to report back to the President, is naming task forces and industry experts to help in its work.

The Cabinet committee is going into oil imports, the income tax incentive of the depletion allowance for oil and gas production, the problem of surplus oil capacity over the world, tankers and pipe lines, and federal controls over sales and prices of natural gas in some 4,100 independent producers of gas in the United States.

The Cabinet study generally is viewed with favor by oil and gas executives. It comes at a time when another government committee on coal is about to blame oil imports for coal's present weak position; when Chairman Daniel F. Reed (R., N.Y.) of the House Ways and Means Committee is about to open a study looking toward curbs on oil imports for the benefit of United States coal and oil; and as Senator Lyndon Johnson (D., Texas) urges a White House commission to study easing, if not ending, the federal controls over gas.

The White House-level fuels study is only one of many programs set in motion during the second session of the 83rd Congress which was several weeks late in closing due to the longest filibuster in years.

Congressional and related federal activity during the session just ended covered some legislation and numerous investigations affecting oil and gas. Subjects dealt with included tankers, taxes, imports, leases on the public lands and government regulation of natural gas. In relation to the latter, there was a sharp crackdown of new federal controls over the gas of independent gas producers. The federal government made progress toward provision for leasing areas of the continental shelf and began work toward disposing of its half billion dollar investment in synthetic rubber plants, for which a number of petroleum companies are bidding. Agreement for settlement of the Iranian oil dispute came during the session, and a parade of new faces constantly popped up in Washington in new jobs.

The tanker legislation, in two major bills, one dealing with trade-ins and one for long term charter, aims at laying keels in the near future for 40 of the fastest tankers in the world, able to sustain a sea speed of 18 knots. This compares with about 16 knots for today's fastest commercial tankers.

Under the trade-in bill, tanker owners are invited to turn over their 10 year old tankers to the government and receive a credit equal to the depreciated value. The trade-in vessel must be in good condition, as it then becomes part of the government's reserve fleet against possible emergency use.

The credit can be used by the owning company to finance a new tanker of design and capacity determined by the oil company, with one exception. The tanker must have a sustained speed of 18 knots; the cost of the extra speed is to be financed by the Maritime Commission, which runs the program.

Millard G. Gamble, president of Esso Shipping Co., testified for the program, saying:

"I have no reason to question the need for the reserve fleet of tankers, which I understand has been determined by the government, nor the need for providing work for the shipyards for national defense purposes.

"Also, it is a fact that many American tanker owners are faced by a serious block obsolescence problem owing to the large proportion of war-built vessels in their fleets.

"While no one can be sure to what extent these problems will be solved by the proposed legislation, it is fairly certain that some additional building will result, and, in all respects, the situation will be improved to a certain degree."

Mr. Gamble said his company's next tankers will be of 35,500 tons, and under normal conditions, would have a 16-knot speed. If the trade-in legislation were passed, he said, he would go along with the 18-knot program.

The long-term charter legislation provides that the Navy may enter into 10-year contracts for the charter of large 18-knot tankers to be built in the future in American shipyards. The tankers are to be of 25,000 tons.

A new departure in providing tankers for the armed forces, which up to the present have been built and owned by the Navy, drew some questioning.

"We have been running the Navy for about 165 to 170 years, and this is the first time we ever planned that somebody else should build what we need in the Navy and that we will rent them," said Representative Carl Vinson (D., Ga.).

Secretary of the Navy Charles S. Thomas replied: "I think you are going to find this will become common practice because we think it is perfectly sound. Under the other way, the government ought to do all construction of every kind."

In the end, a compromise was worked out. A total of 15 tankers are to be built under 10-year charter contracts, with a charter rate of $5 a month per deadweight ton. Another five are to be constructed by direct appropriation of $37.5 million to the Navy, which is to order the vessels constructed. At $5 a ton, the 20 vessels would cost $336 million, against $150 million under the direct appropriation method, it was pointed out. The higher figures, however, also include the heavy cost of operation.

In the field of taxation, the depletion allowance of 27.5 percent was endorsed once again by the Congress, while the Administration said it was studying the allowance preparatory to making a recommendation next year. Another income tax provision to cover intangible drilling costs was written into law; up to the present it has been merely a part of Treasury department regulations. Beyond that, income tax relief for companies doing business abroad, asked by President Eisenhower, failed to receive action during the closing days, although the chances are it will come up next year.

President Eisenhower had asked that foreign earnings of American business firms pay a rate of 38 percent, compared with 52 percent on earnings within the United States. He also asked other income tax benefits on foreign operations. The House of Representatives agreed, but the Senate wanted further study. As it ended, this was the report of House-Senate conferees on the tax bill:

"The Senate amendment deleted these provisions on the ground that they raised a number of difficult problems for which a satisfactory solution could not be evolved in the time available.

"It is the opinion of the managers on the part of the House that in view of the numerous objections raised to the specific provisions of the House bill, the large amount of revenue involved (approximately $145 million) and the difficulty of working out a satisfactory provision in conference, the foreign income provisions should be omitted from the bill and postponed for a more thorough study."

The question of oil imports was up for atten-

(Continued on page 114)

Washington Pipe Line

(Continued from page 113)

tion all during the session, but no specific action was taken except for extension of the Reciprocal Trade Agreements Act for another year. Some petroleum producing groups were urging the Tariff Commission to ask a quota on oil imports, but action along this line is doubtful. The Independent Petroleum Association of America proposed a formula which would allow imports from countries that buy United States goods, and bar them from others. This would shut off imports from the Middle East, while allowing them from Canada, Venezuela and some few other areas. Meanwhile, the White House study may hold the key to future action, if any.

Public lands now being developed for oil and gas were opened up for simultaneous development of uranium and other minerals under a multiple leasing bill completed by the Congress. A number of oil and gas operators from western states argued for the legislation. Another bill completed by the Congress raised the number of acres one operator could have under lease from 15,360 to 46,080 and extended the period of option from two to three years. In Alaska, the leased area could be up to 200,000 acres.

The natural gas situation came in for sweeping changes through the ruling by the Supreme Court that all independent producers of gas who sell to pipe line companies must come under strict price control by the Federal Power Commission. A storm of protest arose, but the FPC went ahead to exercise control. A first action was to invite all independent producers, of whom the FPC estimated there are 4,100, to file details of their prices and sales volumes with the commission by October 1. Another stab was to knock out escalation clauses calling for higher prices year after year, unless first approved by FPC. A third was to deny a go-ahead to a new pipe line, American Louisiana Pipe Line Co., unless all the gas suppliers, including Humble Oil and Refining Co., filed for permission in advance.

Within the natural gas industry a campaign got rolling to overturn the court decision by legislation, but all estimates indicate this may be hard to achieve. The Congress withheld extra funds of some $300,000 asked by FPC to carry out its new powers. One factor watched as a key to the future was whether major independent gas producers would withhold gas from market in view of the new controls.

Although upset by results of the court decision, natural gas executives were in accord with other developments in Washington. The FPC decided to give a fair field, or going price, to gas of Panhandle Eastern Pipe Line Co., after years of using a lower value based on cost. Other pipe line companies are expected to get the same treatment when they ask for it. The Hinshaw bill was completed by Congress, freeing gas pipe lines from FPC control at the distributing end of the pipe line, if the appropriate state exercises control.

Among new faces appearing in Washington bureaus were three new members of the Federal Power Commission: Jerome Kuykendall of Washington state, named for a five-year term as chairman; S. L. Digby of Louisiana, former chairman of the Louisiana conservation unit; and Frederick Stueck of St. Louis, former head of the Missouri Public Service Commission. The three appointments mean that President Eisenhower now has named a majority of the members of the commission. The holdovers from the Truman regime are Nelson Lee Smith and Claude Draper.

Within the government agencies dealing with petroleum, Secretary of the Interior Douglas McKay formally ended the Petroleum Administration for Defense after three and a half years. In its place came a revived Oil and Gas Division, under Hugh A. Stewart, acting director. The OGD asked $300,000 of Congress, and another $150,000 for handling the Connally Hot Oil Act. A number of criticisms of the agency were voiced, but in the end a total of $250,000 was allowed, plus $140,000 for the Connally Act.

Secretary McKay published rules for leasing of oil, gas and sulfur rights in the outer belt of the offshore lands, and prospects are that some leases will be let before the end of the year. The Secretary also named a military Petroleum Advisory Board to advise both Interior and the Department of Defense, and W. W. Keeler, vice president of Phillips Petroleum Co., was elected chairman of the board. The board will advise on military, generally secret matters, much as the National Petroleum Council advises Secretary McKay on non-military matters.

Secretary McKay took a number of steps to pull the government out of the field of synthetic liquid fuels, and even made public the recommendation of an advisory group that the government, now the sole producer of helium, dispose of its facilities to private industry on fair terms. Some in Congress cried "give-away," but the suggestion shows that the Secretary thinks that private business, in general, can operate more efficiently than government.

All in all, the doings of Congress and administration officials met with approval by the petroleum industry. The only action that aroused strong opposition was that stemming from the court decision affecting natural gas. The programs set up during the past few months presage a healthful climate for the industry and, perhaps as important as anything, oil and gas were treated to no harrassing investigations during the year either by Congressional committees, or by government agencies. It is the first time in many years that this can be said.

One cloud in the otherwise hopeful outlook appears in the direction of the Justice Department. There have been hints that Attorney General Herbert Brownell, Jr., is studying a possible antitrust attack on oil, directed against the "follow-the-leader" practice in gasoline pricing, but there has been no definite indication of such action. Mr. Brownell also has the oil cartel suit on the active books, although there is general feeling that this case is so weak that it will ultimately be dismissed.

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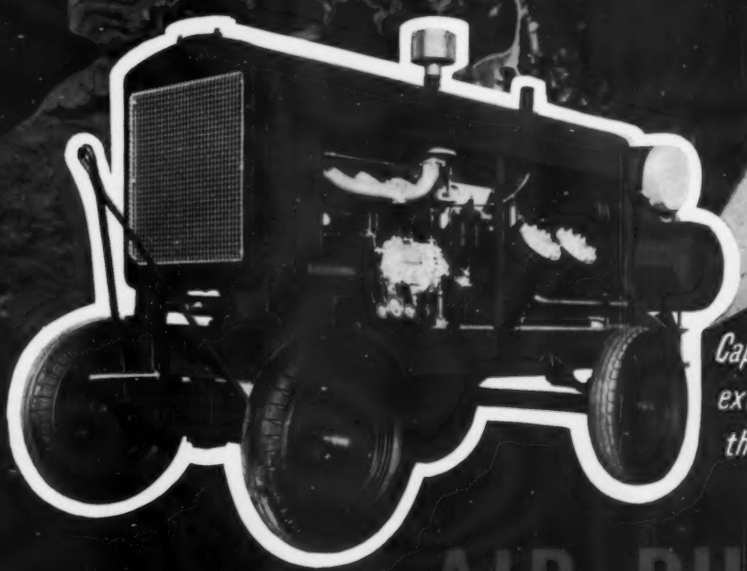

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REVIEW

of recent U. S. patents on petrochemicals

By Heinz Heinemann and Felix Heinemann

A review of patents in the petrochemical field appeared in the February 1954 issue of WORLD PETROLEUM. It has been the opinion of the reviewers and the Editor that this field is too large and too important to permit adequate coverage in an occasional article. The current review is intended as the first of a series of digests which will cover different subjects of a petrochemical nature. In view of their importance for the rubber, plastics, fabrics and paint industries as well as the petroleum refining industry, hydrocarbon polymers and methods of preparing them have been selected as the first subject to be reviewed. Even in thus dividing petrochemical patents, however, it is impossible to cover all of the many patents dealing with polymerization which have issued in the period under consideration, viz., January 1, 1953 to July 1954. The authors have therefore been forced, just as in earlier reviews, to make a selection on the basis of their own judgment as to which patents best reflect current trends in thinking and development.

Homopolymers

Polyethylenes are the subject of several patents. T. Boyd and R. M. Dickey (2,666,756 to Monsanto Chemical Co.) polymerize ethylene to solids with modified cobalt and nickel catalysts in the presence of carbon monoxide and hydrogen at 100-400°C and under 50-6000 atm. pressure. Catalyst promoters are employed. A process for making high molecular weight polymers from ethylene at 230°C and 50-3000 atm. is described in 2,646,425 (A. W. Barry to E. I. duPont de Nemours & Co.). A free radical producing catalyst, a liquid reaction medium (water or benzene) and a two-stage process are employed.

Isobutylene polymers of molecular weight 10,000-20,000 are produced according to H. G. Schneider and P. W. Brakeley, Jr. (2,637,720 to Standard Oil Dev. Co.) by polymerization of a selected fraction from catalytic cracking with boron trifluoride at below 0°C in the presence of 0.1% ether.

E. J. Gomowski (2,626,292 to Standard Oil Dev. Co.) polymerizes normally gaseous olefins at 350-600°F and 200-1200 psi in the presence of a finely divided suspended catalyst comprising supported phosphoric acid. The condensed product stream is separated into a light, catalyst-free phase and a heavy, catalyst containing phase which is recycled. The polymerization of iso-olefins according to 2,681,903 (J. Linsk to Standard Oil Co. of Ind.) is carried out at 0°-150°C with a catalyst comprising $AlCl_3$ and acetone in a ratio of 1-1.3 and in the presence of a cycloparaffin which does not contain tertiary hydrogen atoms. C_4-C_9 iso-olefins are polymerized at —20 to —165°C in the process of 2,682,531 (J. L. Ernst and R. M. Thomas to Standard Oil Dev. Co.). The catalyst employed comprises zirconium tetrachloride complexed with an organic ether, R-O-R', in which R and R' are organic radicals.

The production of cyclooctatriene by reduction of cyclooctatetraene with an alkali metal in the presence of liquid ammonia or of at least two mole equivalents of an organic nitrogen base is disclosed in 2,644,848 and 2,644,849 (L. E. Craig to E. I. duPont de Nemours & Co.).

Two Phillips Petroleum Company patents deal with butadiene polymers. W. W. Crouch (2,631,175) produces liquid polybutadien free from solids by the sodium catalyzed polymerization of butadiene-1,3 free from butadiene-1,2. C. A. Uranek and S. H. Landes (2,630,426) emulsion polymerize butadiene-1,3 to a synthetic rubber, employing an emulsification agent comprising potassium abietate which has been mixed and treated with hydrogen peroxide in aqueous solution at a pH above 7 and a temperature between 100°F and the boiling point of the solution. J. J. Sweely (2,667,471 to Sun Oil Co.) carries out the polymerization of butadiene-1,3 at at least 32°F in aqueous emulsion in the presence of an emulsifying agent comprising alkali metal soaps of a mixture of petroleum naphthenic acids of specific properties.

Several Monsanto Chemical Company patents are concerned with styrene polymerization. In 2,647,111 T. Shusman polymerizes a vinyl aromatic compound with a catalyst comprising a mixture of from 0.02—0.05 parts of di(tertiary butyl) peroxide and from 0.02—0.15 parts of tert. butyl peracetate per 100 parts of polymerizable material. In 2,675,362 Shusman heats styrene monomer containing dissolved 0.03 parts of a peroxy compond (dialkyl peroxide, alkyl perbenzoate or peracetate) and 0.1—0.6 parts of a saturated aliphatic acid containing 12-20 C atoms/mole at 85°-95° C until 25-30% conversion is obtained. The temperature is then slowly raised to 170-190°C.

A polystyrene phonograph record is described by F. Groff, P. B. Potter and R. W. Smith (2,681,323 to Union Carbide and Carbon Corp.). Polystyrene of mole weight 40,000-150,000 is mixed with up to 10% (more than normally compatible) of a natural wax at 160-225°C until a uniform dispersion is obtained.

An annular reactor for the polymerization of liquid olefins with Friedel-Crafts catalyst at below —10°C is described in 2,636,026 (J. F. Nelson to Standard Oil Dev. Co.).

Copolymers

The number of patents issuing on the copolymerization of various hydrocarbons, the catalysts and activators used and methods of controlling the reaction is very large. It is often difficult to group these patents and to discern trends because of the large number of factors involved in the processing.

Standard Oil Development Company is the organization which, according to the number of patents issued, is most active in this field. The next ten patents reviewed here are all assigned to this organization. Copolymerization of styrene and isobutylene in a three-stage process is described by B. R. Tegge (2,643,993). A Friedel-Crafts catalyst is employed at -100 to -140°F in the presence of 1-5 volumes of methylchloride per volume of reactant. Increasing amounts of catalyst are used in successive stages and the conversion is carried to 30-70 percent in the first, 60-90 percent in the second and completion in the third stage. W. S. Sparks and D. W. Young (2,656,340) disclose a rubbery, substantially saturated copolymer comprising at least 95 percent isobutylene and 0.5-5 percent styrene, which has a molecular weight of at least 30,000 and is soluble in paraffinic lube oils at temperatures as low as 10°C and in benzene at 20°C. A composition of a tensile strength greater than 1000 lbs./square inch is produced according to 2,655,492 (D. W. Young and P. E. Hardy) from 85-60 wt. percent solid polyethylene of molecular weight about 20,000 and 15-40 wt. percent styrene-isobutylene copolymer. J. S. Saylor, Jr. (2,644,809) produces a polymer of high unsaturation and high curing rate by polymerizing a major proportion of isobutylene and a minor proportion of a multiolefin with 4-14 C atoms with a dissolved Friedel-Crafts catalyst in the presence of 1-10 volumes of dichloro difluoromethane at below -20°C. In 2,657,190, F. W. Banes, A. M. Gessler and W. F. Fischer discuss an oil resistant rubber composition which comprises 50-85 percent of a copolymer of butadiene-1,3 and acrylonitrile and 50-15 percent of a vulcanizable emulsion polymerized homopolymer of conjugated C_4 and C_5 isoolefins and a conjugated diolefin of 4-8 C atoms by polymerization at below -40°C with a Friedel-Crafts catalyst dissolved in a non-complexing solvent. The polymer also contains 4-8 percent of a divinyl aromatic. W. J. Sparks and J. F. Nelson (2,625,538) describe a method of modifying and controlling the copolymerization of isobutylene and conjugated-diolefin by the presence of a polymerizable monoolefin with 4-16 C atoms/mole which has a lower tendency to polymerize than isobutylene. An oxidized copolymer is the subject of 2,674,586 (L. M. Welch). A copolymer of an isoolefin and a cyclic diolefin which has both double bonds in the ring is contacted at 90-200°C with an oxidizing agent such as air, oxygen, benzoyl peroxide or calcium peroxide until 0.1-5 percent oxygen is combined with the copolymer. In 2,625,523, J. D. Garber and W. J. Sparks prepare a surface coating composition consisting of a combination of linseed oil and a heat bodied, solid, hydrocarbon soluble, low elongation polymer of a major proportion of butadiene and a minor proportion of isooctene prepared with a Friedel-Crafts catalyst at 10 to -40°C. G. E. Sermiuk (2,624,726) produces a hard synthetic resin from a benzene hydrocarbon free from olefinic unsaturation and a conjugated diolefin with 4-6 C atoms. A solution of aluminum chloride in an inert non-complexing solvent is the catalyst.

Catalysts for butadiene-styrene copolymerization are disclosed in several Phillips Petroleum Company patents. J. E. Pritchard and C. F. Fryling (2,640,821) use p-methoxyphenyl diazothio-(2-naphthyl)- ether and a tertiary alkyl mercaptan at -10 to 60°C. W. B. Reynolds, J. E. Wicklatz and T. J. Kennedy, (2,638,464) employ 0.1-10 millimoles of dimethyl (chlorophenyl) hydroperoxymethane, 0.1-3 millimoles of alkali metal ferrous pyrophosphate and a reducing sugar per 100 parts of monomer. J. E. Wicklatz and F. M. Smith (2,682,529) polymerize at 10 to -40°C in an aqueous emulsion at a pH of 9-12 with a catalyst comprising hydroperoxides of octahydrophenanthrenes. An alkali metal soap emulsifying agent and an alkyl mercaptan with 8-16 C atoms are also present. W. F. Faragher (2,634,257 to Houdry Process Corp.) produces high molecular weight, elastic polymers from butadiene and styrene in a solution of ethylbenzene.

The emulsion polymerization of butadiene-1,3 and styrene is stopped according to R. W. Brown (2,667,472 to United States Rubber Co.) by addition to the emulsion of 0.1-1 percent (based on monomer) of a xanthogen polysulfate containing 3-7 sulfur atoms per mole. According to the same inventor's patent 2,680,111 (to U.S. Rubber Co.) butadiene-1,3 and aryl olefins are copolymerized in an emulsion containing soaps of monocarboxylic acids as emul-

(Continued on page 118)

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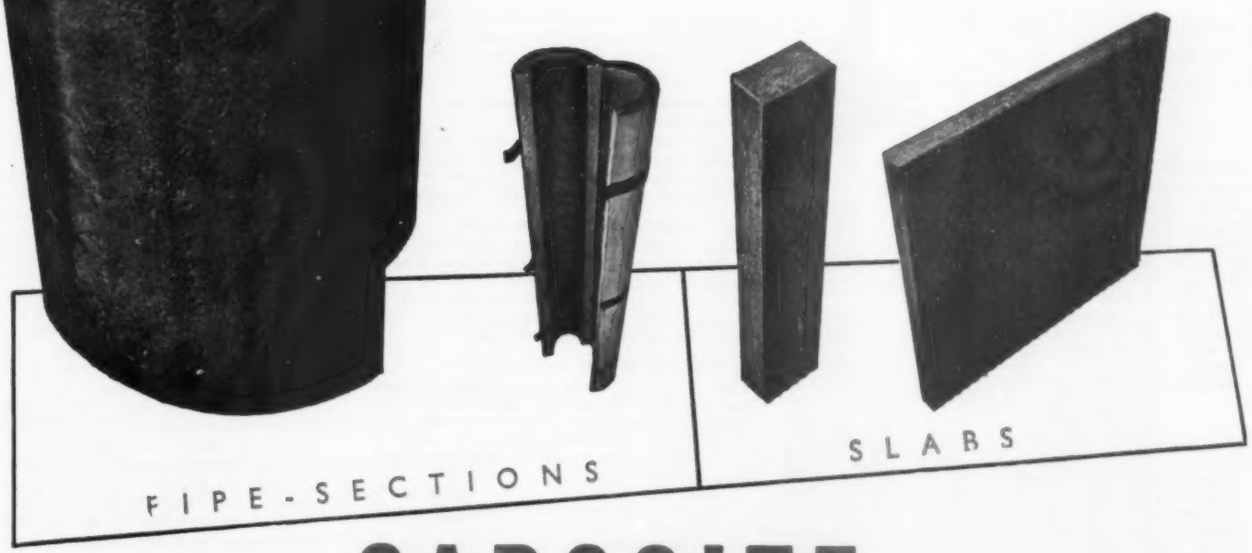

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Patent Review

(Continued from page 116)

sifying agents, organic hydroperoxides as catalysts, polyalkylene polyamine activators and ammonia in excess of that required to neutralize the soap forming acids. Two other U.S. Rubber Company patents deal with copolymers. In 2,681,898 L. E. Daly describes a composition comprising polystyrene, a resinous copolymer of styrene and butadiene and a rubbery copolymer of butadiene and styrene. L. H. Howland and W. S. Chambers in 2,681,331 produce a synthetic rubber from aqueous emulsion polymerization, which consists of 80 wt. percent butadiene-1,3, 10 percent 2,3-dialkyl butadiene and 10 percent vinyl pyridine.

W. W. Crouch and W. M. St. John (2,638,460; 2,638,461 to Phillips Petroleum Co.) deal with a rubber-like, sulfur vulcanizable composition which comprises an organic elastomer (such as natural rubber or synthetic polymers of conjugated diolefins) and a liquid polymer prepared from monomers of butadiene-1,3 or pentadiene. Another Phillips Petroleum Company patent (2,625,525, C. S. Lynch) discloses a finely divided resinous material in stable dispersion in an aqueous medium (latex) which is prepared by emulsifying a monoolefinic organic compound and 0.3-15 percent polybutadiene in the presence of sulfur dioxide.

Drying Oils

Polymeric drying oils are described in two Universal Oil Products Company patents. H. Pines in 2,632,777 forms polyolefinic polycyclic hydrocarbons from decahydronaphthalene and an olefin, such as pentene or methylcyclohexene by conjunct polymerization with hydrofluoric acid at 0-200°C. H. S. Bloch and and A. E. Hoffman (2,644,847) subject a hydrocarbon drying oil recovered from a polymerization sludge to isomerization in the presence of a conjunct polymerization catalyst in less than the theoretical quantity required to form complexes, until the diene number has been reduced to form 15-65.

According to J. H. Sample (2,650,907 to Sherwin-William Co.) a vinyl aromatic compound and a non-conjugated unsaturated oil, partially polymerized by air-blowing of semi-drying or drying oils, are copolymerized at 225-500°F in the presence of 0.02-1 percent of a heavy metal drier soluble in the oil and 0.5-2 percent of a metal-free peroxide. D. F. Koenecke and J. F. McKay (2,669,526 to Standard Oil Dev. Co.) prepare an oily siccative diolefin polymer for an enamel by polymerizing conjugated diolefins with 4-6 C atoms per mole in the presence of a hydrocarbon soluble peroxide and metallic sodium.

Polymers with Non-Hydrocarbon Components

This is a very large field and it is difficult to define where petrochemical methods yield to chemical synthesis. For purposes of this review, a rather narrow selection has been made and only patents have been considered which deal with polymers containing at least one hydrocarbon component or a common hydrocarbon derivative.

DuPont patent 2,636,023, (P. J. Culhane and G. M. Rothruck) describes an acetone soluble copolymer of vinyl chloride, acrylonitrile and vinyl pyridine. A vinyl halide-acrylic ester polymer is the subject of 2,651,626 (W. L. J. de Nie to Shell Dev. Co.). Between 95 and 80 wt. percent of vinyl chloride and vinylidene chloride and 5-20 percent of methyl acrylate are polymerized in aqueous solution with a peroxide catalyst. J. L. V. Winkle and R. C. Morris (2,640,857 to Shell Dev. Co.) chlorinate a methylpentadiene polymer, which has been prepared at 80-800°C in the presence of sulfur dioxide, molecular oxygen or peroxides, by reacting the polymer with chlorine in an inert solvent at 0-150°C until the product has a chloride content of at least 10 percent. C. B. Havens (2,680,106 to The Dow Chemical Co.) describes a copolymer comprising 88-94 percent vinylidene chloride, 12-6 percent vinyl chloride and containing 0.5-5 percent testrasodium pyrophosphate, 1-5 percent acetyl triethylcitrate and 2-6 percent salol.

A resinous copolymer of 0.4-0.6 mole fractions of alpha-methylacrylonitrile, which has a molecular weight of 90,000-250,000 is described by R. M. Schulken and R. E. Boy in 2,652,391 (to Eastman Kodak Co.). The polymerization of acrylonitrile and methacrylonitrile is carried out according to G. F. d'Alielo (2,656,341 to Koppers Co.) with a catalyst combination of tertiary butyl perbenzoate and a benzoyl peroxide at 25-80°C until at least 60 percent conversion is affected. The polymerization is then completed at 85-125°C.

Carbon monoxide polymers are disclosed in a group of duPont Company patents. In 2,652,-372 M. W. Farlow and E. C. Herrick produce a hydrocarbon polymer, orientable by cold drawing, which is the reaction product of carbon monoxide and hydrogen, melts above 130°C and has an inherent viscosity of at least 1.1 at 0.1 percent concentration in tetrahydronaphthalene at 125°C. E. L. Little in 2,641,590 describes polymers formed from carbon monoxide and monoolefins, such as ethylene, which are useful as greases, polyketones, etc. The reaction is carried out at at least 200°C and at 250 atm. pressure over alkali metal, alkali metal hydride or alkali metal alkyl as catalysts. Basic ammonia type compounds may participate in the reaction to produce nitrogen containing polymers. In 2,634,254 R. D. Lipscomb polymerizes 99-51 mole percent of an aliphatic monoolefin containing a terminal methylene group and from 2-4 C atoms/mole with 0.1-10 mole percent sulfur dioxide and .9-39 mole percent carbon monoxide.

The emulsion polymerization of sulfur dioxide and monoolefins yields a heteropolymeric resin, according to W. W. Crouch and E. W. Cotten (2,645,631 to Phillips Petroleum Co.). G. R. Barrett (2,675,370 to Monsanto Chemical Co.) slurry polymerizes in a continuous process

(Continued on page 120)

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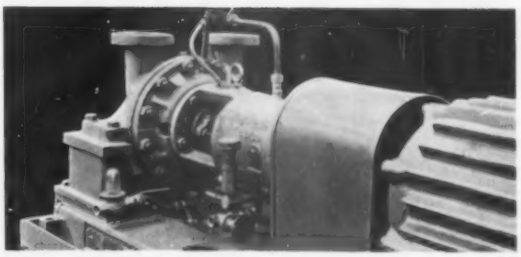
Single and Two-stage, for quantities up to 1,100 I.G.P.M., differential heads up to 1,000 ft., and temperatures up to 800°F.



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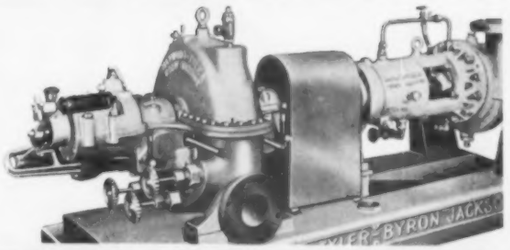
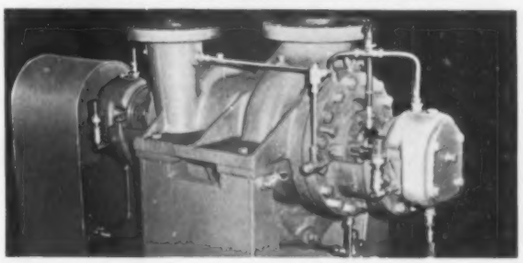


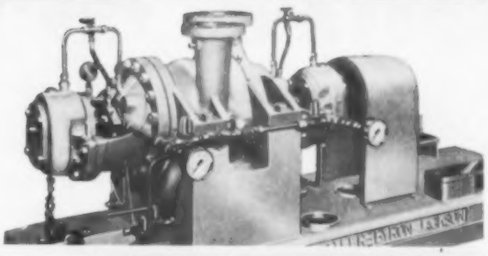
TYPE DSHO REFINERY PUMPS

Double Suction Hot Oil pumps with low inlet velocities ensuring maximum freedom from cavitation. For quantities up to 3,000 I.G.P.M., differential heads up to 1,400 ft., and temperatures up to 900°F.



TYPE VC REFINERY PUMPS

Two-stage pumps with vertically cut casings, for quantities up to 5,000 I.G.P.M., differential heads up to 1,500 ft., and temperatures up to 900°F.



TYPE VMT AND VHT PUMPS

Multistage pumps, with underground suction casings, giving excellent performance when handling hot or cold liquids with a low nett positive suction head. For quantities from 100 to 7,000 I.G.P.M. and heads up to 1,800 feet.

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styrene and an unsaturated compound from the group consisting of maleic anhydride, alkyl esters of maleic acid admixed with maleic anhydride and mixtures of maleic anhydride and acrylic or methacrylic acid.

Lubricating Oil Additives

Polymers have recently found wide application as viscosity index improvers and surface active agents in compounding of lube oils.. A few examples in this field of interest to the petroleum industry are given below.

In 2,631,176 (to Standard Oil Dev. Co.), R. L. Heinrich prepares a high viscosity polymer with lube oil characteristics from an alpha-monoolefin with at least 4 C atoms/mole, such as butene-1, decene-1, etc. by polymerization at 75-250°F in the presence of an aluminum halide catalyst and a minor amount of a promoter consisting of alcohols, ketones, peroxides, aldehydes and organic acids. In the same company's patent 2,638,445 D. W. Young, W. H. Smyers and W. J. Sparks disclose a mineral lube oil soluble polymer of molecular weight 4,000-50,000 which has surface active and viscosity index improving properties and is produced by reacting 50 parts of styrene-isobutylene polymer with 15 parts fuming sulfuric acid at 100°C and then neutralizing with barium hydroxide.

Monoalkyl ethylenes can be polymerized to highly viscous polymers of lube oil additive characteristics with the use of aluminum bromohalide catalysts which are hydrocarbon soluble, (2,678,957 C. M. Fontana and R. J. Herold to Socony-Vacuum Oil Co.). Mixed bromide and chloride catalysts are suitable. The reaction is carried out at low temperature.

Speeding the flow

When the flow of oil must wait for the erection of new plant, the degree of skill and resource brought to the work of construction is a major economic factor. For this skill there is no firm grounding other than wide, first-hand, practical experience of process engineering for petroleum and petrochemicals, of the kind possessed by D. & C. and William Press Ltd.

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C_3 and C_4 olefins can be converted to polymers adapted for lube oil additives at 70°F with sulfuric acid catalyst of 85-99 percent concentration in the presence of minor amounts of low boiling isoparaffins (2,670,392, W. F. Glassmire and J. H. Phillips to The Texas Co.). The isoparaffins act as promoters, do not undergo alkylation and reduce acid consumption. C. F. Feasley (2,660,572 to Socony-Vacuum Oil Co.) discusses a polymeric material having a low power factor which he produces by heating at 250°F an aromatic petroleum stock (boiling from 360-560°F) with formaldehyde and Super Filtrol. The liquid fraction of the reaction product is treated with Super Filtrol at 180°F and then fractionated under reduced pressure.

Catalysts and Activators

While some catalysts and particularly free radical catalysts have been discussed in earlier sections, some other examples of interesting polymerization catalysts are listed here.

T. Boyd (2,650,913 to Monsanto Chemical Co.) makes ethylene polymers at 260-300°C and 2500-3000 atm. over 2,2-bis (tert. butyl peroxy) butane as a catalyst.

Two Phillips Petroleum Company patents are concerned with silicaalumina type catalysts. In 2,667,521 E. C. Harney discusses a moving bed process for the polymerization of low boiling monoolefins over silica-alumina. J. P. Hogan in 2,642,457 copolymerizes isobutene and 2-butene in contact with silica-alumina promoted with 0.05-10 percent nickel or cobalt oxides. Silica-alumina catalyst is also used in the combination cracking and polymerization process of 2,678,904 (K. K. Kearby, I. Kirshenbaum and J. O. Smith to Standard Oil Dev. Co.) in which olefins from catalytic cracking are polymerized in a fluidized bed over freshly regenerated catalyst and catalyst from the polymerization zone is passed to the cracking reactor.

Phosphoric acid catalysts are described in Standard Oil Development Company patents 2,642,402 and 2,626,289 to 2,626,291. In the former (E. S. Corner and C. S. Lynch) a silica base is heat treated at 400-1250°F for at least two hours. The gel is then mixed with phosphoric acid, pulverized, dried at 375-425°F and calcined at 600-1000°F. The final catalyst contains 50-90 wt. percent H_3PO_4. The latter group of patents (F. R. Russell, W. K. Fell, J. D. Leslie and R. L. Betts) describes a fluidized or slurry operation for polymerizing normally gaseous olefins at 350-600°F at pressures above the critical pressure. The fluid bed may be followed by a fixed bed in which unconverted olefins are reacted.

Sulfur trioxide is the catalyst in M. T. Howerton's disclosure (2,670,393 to the University of Notre Dame) for the production of di-, tri- and tetra-isobutylene from isobutene at 25-150°C and 0.5-1 atm. pressure.

A hydroxylated aluminum chloride catalyst in solution of methylchloride in concentrations of 0.4 to 0.5 g. per 100cc. is used for the polymerization of isobutene by J. D. Calfee and C. A. Kraus (2,644,798 to Standard Oil Dev. Co.). F. T. Wadsworth (2,631,996 to Pan American Refining Co.) converts dripolene to a stable resin of light color and low iodine number with 0.5-5 percent boron triflurode and 0.02-2 percent iodine at 500-650°F.

Polymerization of ethylenic compounds can be carried out with palladium oxide on a porous siliceous base (2,656,398 A. N. Vault to Phillips Petroleum Co.) or with a molybdite catalyst which is a metal salt of H_2MoO_4, according to 2,634,260 (J. E. Carnahan to E. I. du Pont de Nemours & Co.).

Activators for the polymerization of butadiene-1,3 in aqueous emulsion with peroxide catalysts are described in two Polymer Corporation patents (H. L. Williams and J. M. Mitchell). In 2,631,142 a water soluble organic chelate complex of a salt of ethylene dinitrilo tetraacetic acid and iron and an alkali metal is employed. In 2,655,495 the activator consists of ferrous sulfate, alkali metal pyrophosphate and soluble organic chelate complexes plus a small amount of soluble arsenite.

(Continued on page 122)

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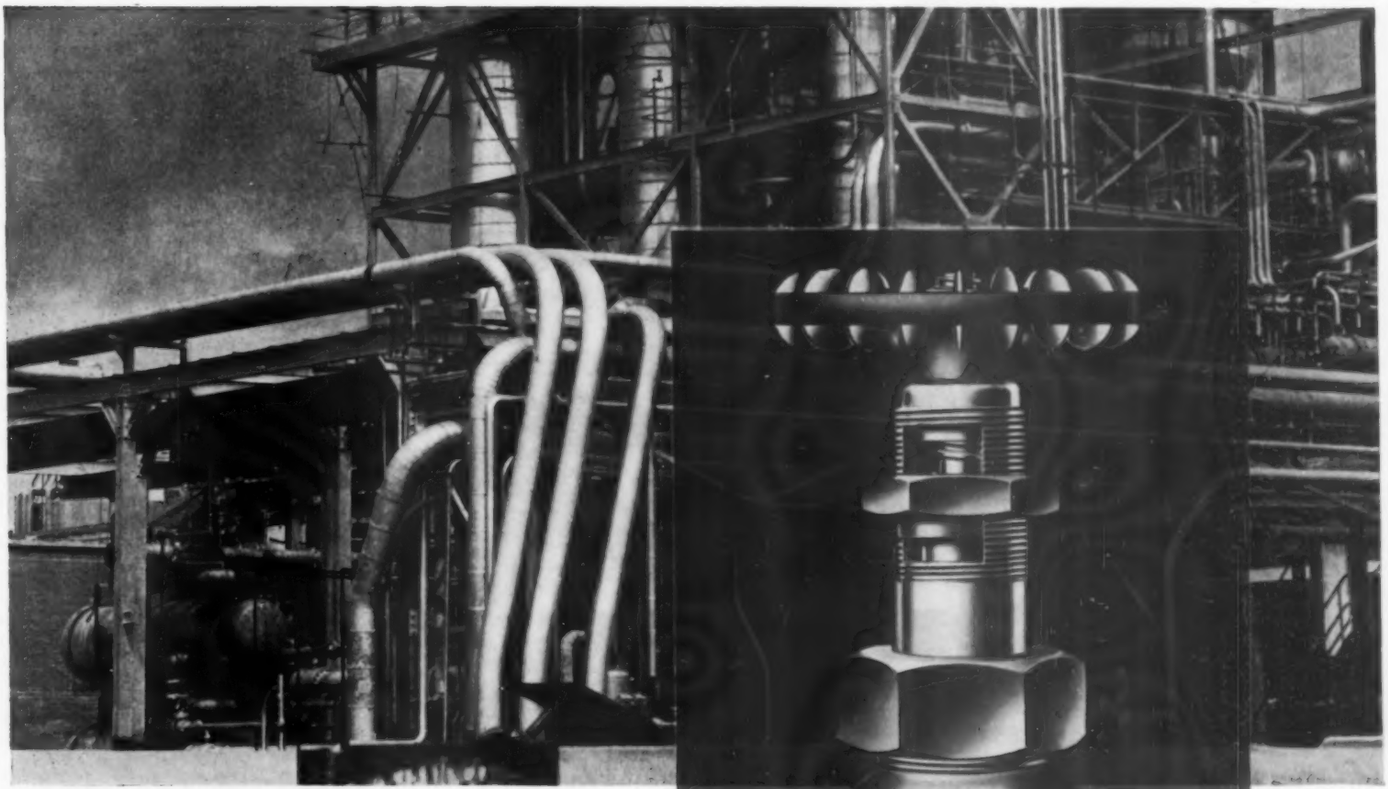

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Socket Weld Ends Ball Joint,
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Patent Review

(Continued from page 120)

Stabilization of Polymers

Stabilization of polymers against oxidative deterioration is, of course, related to the methods used for inhibiting oxidation of other classes of hydrocarbons (see World Petroleum, June 1954). A few characteristic patents are digested below.

E. F. Hill and D. O. DePree in four patents to Ethyl Corporation (2,651,620 to 2,651,623) stabilize a rubber-like olefin containing hydrocarbon polymeric elastomer against atmospheric deterioration by incorporation of ureas or thioureas in which the nitrogens are substituted by hydroxylphenyl, aminophenyl, alkyl and aryl groups. Amines or guanyl substituted cyanamides and dihydrocarbon substituted carbodiimides are used by J. M. Goppel, G. E. Rumscheidt and J. T. Hackman (2,654,679-2,654,680 to Shell Dev. Co.) for stabilization of a rubbery polymer prepared from conjugated diolefin or isoprene and sulfur dioxide in the presence of a peroxide. Acyl-p-aminophenol is the antioxidant proposed for solid synthetic rubber in Standard Oil Development Company patent 2,654,722 (D. W. Young and D. L. Cottle). Stabilization of a rubber-like copolymer of a conjugated diene monomer and a vinyl aromatic monomer by means of a water insoluble stannous amine complex is proposed in 2,632,754 (H. E. Albert to The Firestone Tire and Rubber Co.).

Three Dow Chemical Company patents treat stabilization of acrylonitrile polymers. G. W. Stanton and F. A. Ehlers in 2,681,328 use as a stabilizing agent 1-20 percent of a compound from the group consisting of dimethyl-amino ethanol, 2-(2-dimethylamino ethoxy) ethanol, 1-dimethylamino-2-propanol and derivatives. In 2,681,329 and 2,681,330 the same inventors employ N-alkyl hydroxyacetamides and hydroxymethyl formamides.

Stabilization of an interpolymer of an isoolefinic hydrocarbon containing 4-8 C atoms and a polyolefinic hydrocarbon containing at least 0.5 percent combined bromine by incorporation of a silicate of a metal of group II of the periodic system is disclosed in 2,681,899 (R. A. Crawford and R. T. Morissey to The B. F. Goodrich Co.).

Rockwell Testing Station

The world's largest meter and valve testing station built expressly for testing meters and valves under actual operation conditions has been opened on the outskirts of Pittsburgh by Rockwell Manufacturing Co.

Special facilities are provided for tests with viscous petroleum products, gasoline, fuel oil and liquified petroleum gas. Five above-ground storage tanks with a combined capacity of 35,000 gallons are laid out in a row behind, and at an elevation some 20 feet above, an outdoor concrete testing area. The height differential permits the use of gravity feed when desired.

The new test station will help advance research and development for the design of metering devices that can be used as industrial accounting aids, according to L. A. Dixon, Jr., vice president of Rockwell's Meter and Valve Division.

Meters undergoing test are installed in test lines and their readings checked against the weight or volume of liquid flowing through them to cylindrical prover tanks set on scales. Rates of fluid flow ranging from "a trickle" to several thousand gallons per minute are provided by five strategically located electric pumps.

Rockwell's Nordstrom valves and special valve lubricants are tested for endurance and smooth performance.

The station is Rockwell's answer to a problem which has long confronted meter and valve manufacturers — the problem of reproducing actual field operating conditions for testing purposes.

Test facilities in the viscous petroleum products area include three 5,000-gallon tanks for storage of bunker "C", sweet crude and sour crude, respectively. The tanks are manifolded to two pumps, one with a maximum capacity of 800 gpm, the other adjustable from zero to a maximum of 200 gpm.

Gasoline and fuel oil are stored in two 10,000-gallon tanks which are manifolded into three pumps, two or all three of which can pump either fluid through the four test runs in this area. With all three pumping, a rate of several thousand gpm can be achieved.

Two six inch and two four inch diameter test runs are manifolded to empty into two indoor prover tanks of 1,000 and 2,000-gallon capacity, respectively, or back into the storage tanks.

Located along the return run to the storage tanks is the bulk station loading rack, capable of mounting two loading arms in diameters of 2½, 3 or four inches. Next to the rack is a truck meter prover pit with a 300-gallon prover tank.

Rockwell loading rack meters, ticket printer registers and the company's new remote registration system are tested here as gasoline and fuel oil are pumped through the loading arms into the hatches of a 2,100-gallon, five compartment tank truck bought for the test facilities.

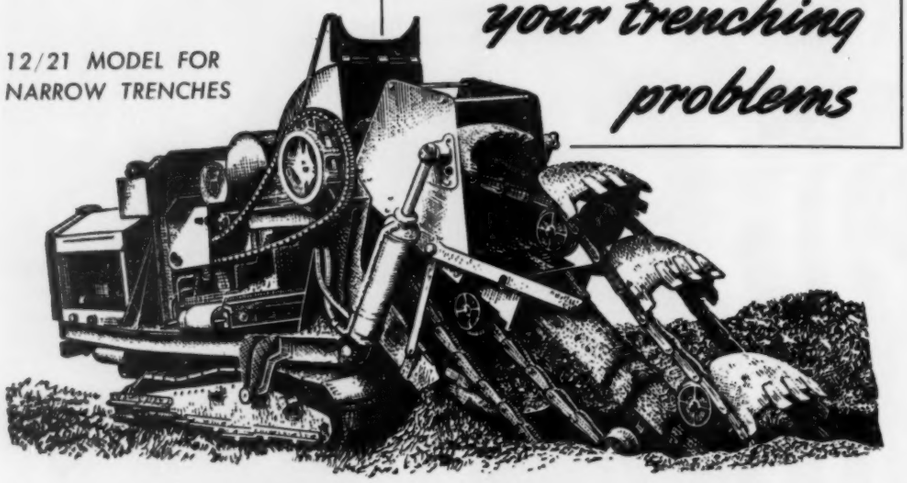
Fill boxes are provided for two underground storage tanks—a 1,000-gallon tank for fuel oil and a 2,000-gallon tank for supplying gasoline to a row of dispensing pumps. Fill lines have been provided for testing Rockwell dispensing pump meters.

Test equipment for LPGas meters consists of an electric pump and a 1,000-gallon rack-mounted, semi-portable propane storage tank. The fluid is pumped at a rate of flow up to 100 gpm through an approved Parkhill-Wade piping test run to a gravimetric prover.

In addition to meeting all local, state and national safety requirements, Rockwell has followed every additional precaution offered by insurance company experts to protect the new facility against fire.

The answer to all your trenching problems

12/21 MODEL FOR NARROW TRENCHES



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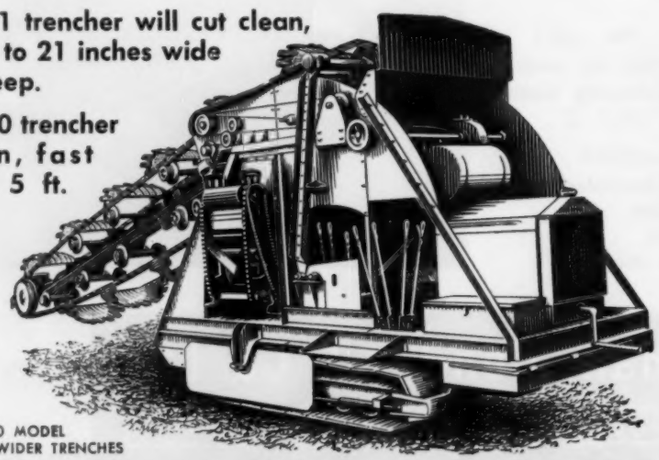
The Model 12-21 trencher will cut clean, fast trenches 13 to 21 inches wide down to 6 ft. deep.

The Model 16/60 trencher will cut clean, fast trenches up to 5 ft. wide down to 14 ft. deep.



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This is a Stripping Tower for one of the Aden Crude Topping Units and has been constructed to A.P.I. A.S.M.E. Code. It has a diameter of 5'6", its overall length is 62'2", and it weighs 17 tons. (Photograph by permission of Messrs. E. B. Badger & Sons Ltd., and Anglo-Iranian Oil Co., Ltd.)

To ADEN

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INTERNATIONAL NEWS AND NOTES

Refinery Expansion Approved

The Commission for the Control of Petroleum Industry (Commissione Interministeriale per la Discipline Petrolifera) approved, in its last meeting, a further expansion of Italian refining capacity. The erection of three new refineries in Sicily (ISLOM) at Gaeta near Naples (GOLFO) and near Milan (Casati) has been authorized jointly with expansion and additions of new units at existing refineries. The whole increase in Italian refining capacity will be about 5,000,000 metric tons per year (100,000 b/d), and overall refining capacity will reach the new peak of 27,000,000 metric tons per year.

The decision to authorize such a substantial expansion is generally considered dangerous for the whole Italian petroleum economy, not only by refiners and technical experts, but also by workers' unions representatives, who are generally in favor of every industrial expansion capable of leading to fuller employment of labor.

As is known, under the present regulation the allotment of crude to be treated for the domestic market demand for finished products is made by the Ministry of Industry and Commerce according to the refining capacity. Such allotments, presently averaging 30 percent of the capacity of the different refineries, will be reduced (on a proportional basis) after the entry into production of the new plants. Crude which is treated for export is free from government control, but a further expansion in exports is possible in the immediate future. Settling of the Iranian dispute and the erection of large refineries in the sterling area were sources of worry to Italian refiners even before the announcement of the Italian government decision.

Peruvian Test Planned

Peruvian Oils and Minerals Ltd., Toronto, and Texas Gulf Producing and Refining Co., Houston, through its Peruvian subsidiary, Compania de Petroleo Ganzo Azul, have signed an agreement covering initial exploration-development on the Canadian company's Santa Clara acreage in the Amazon Basin.

The agreement covers the drilling by Ganzo Azul of a test well to 5,000 feet if necessary on the Santa Clara dome. Peruvian Oils holds concessions totalling approximately 1,800,000 acres, of which from 50,000 to 60,000 acres are on the Santa Clara structure. Ownership under the agreement will be divided in the ratio of one-third to Peruvian Oils and two-thirds to Ganzo Azul. Compania Ganzo Azul is operating the only producing oil field in central Peru, the Ganso Azul field, 160 miles from the Santa Clara area.

Mapping British Guiana

Photo-mapping of a 38,000 square mile area in central British Guiana started in August. Spartan Air Services Ltd., 348 Queen Street, Ottawa, was awarded the assignment by the Colonial Surveys Office, London, and the air photos are to be delivered to the office of Brigadier Martin Botine, Director of Colonial Surveys.

Atlantic to Sell Subsidiaries

The Atlantic Refining Co. has agreed to sell its marketing subsidiaries in the eastern hemisphere to Anglo-Iranian Oil Company Ltd., it was announced by Henderson Supplee, Jr., president of Atlantic. It is expected that Anglo-Iranian will take over the operation before the end of 1954.

Royal Dutch Shares Listed in New York

Shares of Royal Dutch Petroleum Company were listed on the New York Stock Exchange and trading in the securities began on July 20. In a ceremony attending the placing of shares before American investors, J. H. Loudon, joint managing director of Royal Dutch, and Keith Johnson, president of the New York Stock Exchange, hailed the event as a significant indication of the broadening interest among investors in the securities of international companies and the freer movement of trade among nations, attesting the improvement in world economic conditions.

Greece Invites Refinery Bids

The government of Greece has asked engineering firms to submit bids for construction of a refinery of 30,000 b/d capacity. The proposals are to be submitted to the General Directorate of the Ministry of Coordination by September 20. The firm selected must be prepared to undertake not only the erection and equipment of the processing plant, but also the civil engineering work and provision of transport facilities. It must also agree to operate the refinery for two years after completion if the government so requires.

Stock Interest Sold

California Texas Corp., an affiliate of The California Texas Oil Co. Ltd., has sold a 50 percent stock interest in Mediterranean Refining Co. (Medreco) to Socony-Vacuum Overseas Supply Co. Medreco is building a refinery at Sidon, Lebanon in accordance with the wishes of the Lebanese government and under its convention with that government. The products of this refinery will be distributed within the area.

Alaska Surveys

Standard Oil Co. of California has two field parties making geophysical and geological surveys in Alaska this summer, to continue reconnaisance and other work related to an evaluation of oil prospects which has been carried on for the last two years. No actual drilling for oil is contemplated. Three company geologists, headed by C. E. Kirschner of San Francisco, are carrying on survey work in south-central Alaska, and the Robert H. Ray Co. of Houston, Texas, working under contract, has started seismic survey work on the Kenai Peninsula near Seward.

Standard has been interested in Alaskan oil prospects at various times since the early 1920's. Three wells were drilled or started in the Kanatak area in the years 1923 to 1926 and abandoned. Another was drilled in the Kanatak area as the result of joint reconnaissance work undertaken with two other oil companies in 1937-39, but it, too, was abandoned.

Philippine Exploration

The application of Caltex (Philippines), Inc., for oil exploration rights in some 500,000 hectares of northern Luzon were approved July 18 by Secretary of Agriculture Salvador Araneta. However, a few days later the Philippine Oil Development Co. and the Standard Vacuum Oil Co. each filed notice that they had made previous application for concessions in part of the area granted to Caltex. Hearings have been scheduled by the Agriculture Department to unravel the conflicting claims.

To Drill at Mafia

Preparations are being made for drilling a test well on the island of Mafia lying off the coast of Tanganyika, Africa. The test is a joint undertaking of Shell and Anglo-Iranian.

A night view of the SO_2 unit now in commission at Anglo-Iranian Oil Company's new oil refinery at Little Aden.

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New Oil Find in Sicily

Anglo-Iranian Oil Company announced at the end of July that its subsidiary engaged in drilling in Sicily had found oil at a depth of 9,800 feet in Ragusa. It is stated that six additional wells will be drilled as fast as the necessary equipment can be supplied.

This discovery followed an earlier one by the International Fuel and Petroleum Co., a Gulf subsidiary, which now has three producing wells in the Ragusa district, each yielding about 700 b/d of oil of 19° API gravity.

These discoveries have set off a lively boom in Sicily and test drilling will be rapidly extended to other concessions in that state.

Philippine Reconnaissance

The Philippine Oil Development Co. has completed a geological reconnaissance survey of the oil concessions it has applied for in the Cagayan Valley in northern Luzon. Several structures of the type that warrant drilling were observed. "Three of these were particularly interesting," according to Anthony Macleod, executive vice president of the company. He has announced that the next phase of the survey work will be undertaken on the company's leases in the Tarlac area.

Enlarged Capacity for Lebanon Refinery

Mediterranean Refining Company's plant near Sidon, Lebanon is being enlarged from its original capacity of 6,000 b/d to 9,000. The increase was undertaken, according to a report from Beirut, following the acquisition of a 50 percent interest by Socony Vacuum. The refinery is designed to supply products to Lebanon using crude brought by pipe line from Saudi Arabia.

M. P. Jones

Returns from Venezuela

Maynard P. Jones, vice president of Exploration Seismic, Inc., has returned to Dallas from Caracas, Venezuela, to take charge of the company's domestic operations. He has been in Caracas since joining the firm in 1952.

Mr. Jones has been engaged in technical services to the oil industry since 1934, 18 years of this period being spent in various phases of geophysical exploration. He was chief geophysicist for Central Petroleum Corp., Houston, before joining Exploration Seismic, Inc. in 1952.

Mr. Jones' work in geophysical exploration has covered all phases of operations by both seismic and gravimetric methods, including field operations, interpretation, research and administrative functions. The major portion of his experience, however, has been in the supervision of seismic survey work and of interpretation of seismograph data.

Peruvian Minister of Fomento

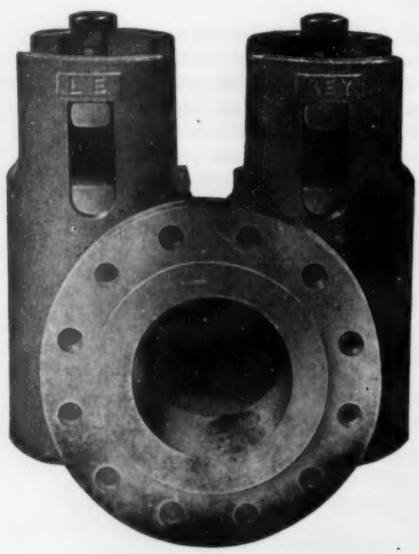
Eng. Fernando Noriega Calmet, general manager of Empress Petrolera Fiscal and, since the enactment of the new petroleum law until his recent resignation, acting Director de Petroleo of the Peruvian Government, has been appointed Minister of Fomento. He was awarded at the same time with the order of the Sol. His efficiency and ability in the difficult task of organizing the new oil department and the dispatching of the great number of applications for oil concessions was highly appreciated by the national and foreign oil companies, with which he always maintained most cordial relations.

Aden Refinery on Stream

The Anglo-Iranian Oil Company's new $150 million refinery at Aden on the southern tip of the Arabian peninsula went on stream August 4, four months ahead of schedule. Capable of processing 120,000 barrels of crude oil daily, this new addition is the largest of 14 refineries which Anglo-Iranian, either alone or with other interests, controls in Britain, Europe, the Middle East and Australia, and it brings the group's daily refining capacity to nearly 600,000 barrels. This is without the huge 500,000 b/d Abadan (Iran) plant which was nationalized in 1951.

Three Wells at Nahorkatiya

Nahorkatiya No. 3, the third deep well to penetrate the newly discovered oil bearing zone beneath the Brahmaputra Valley alluvium in upper Assam, gives promise of being a successful producer, the Assam Oil Company announces from Digboi. Initial tests at 11,048 feet indicate that it is capable of yielding a steady 500 barrels of crude oil a day. Well No. 4 on the north bank of the Burhi Dihing river, is drilling.



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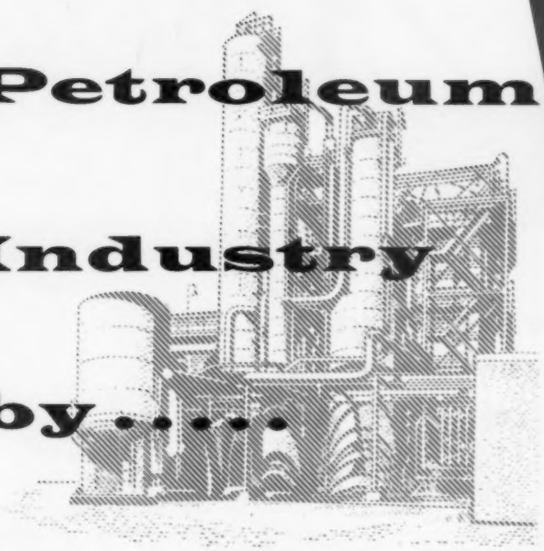

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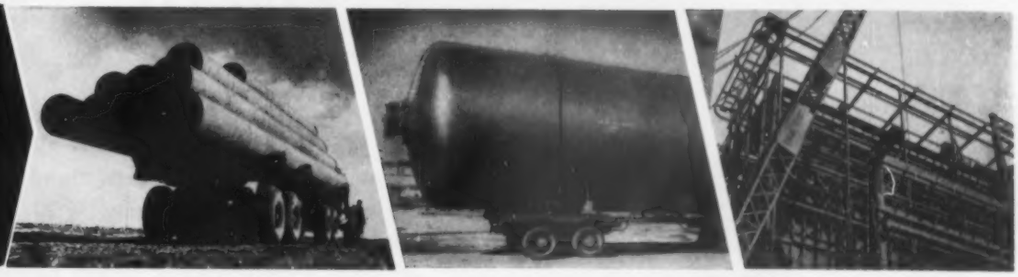

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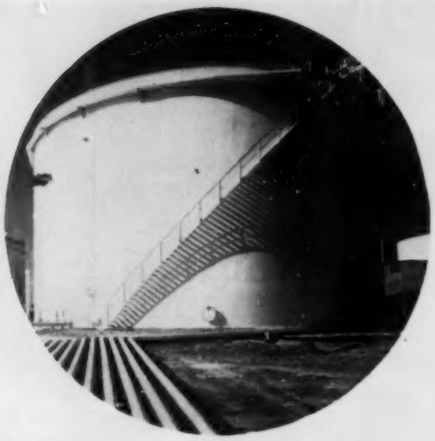

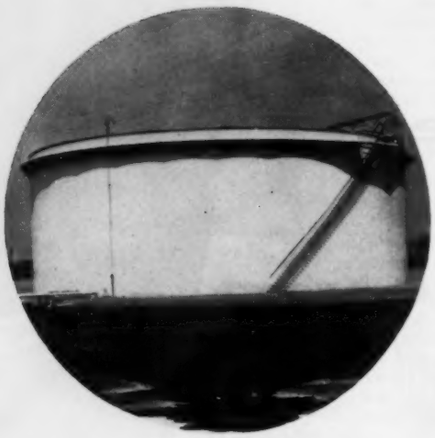

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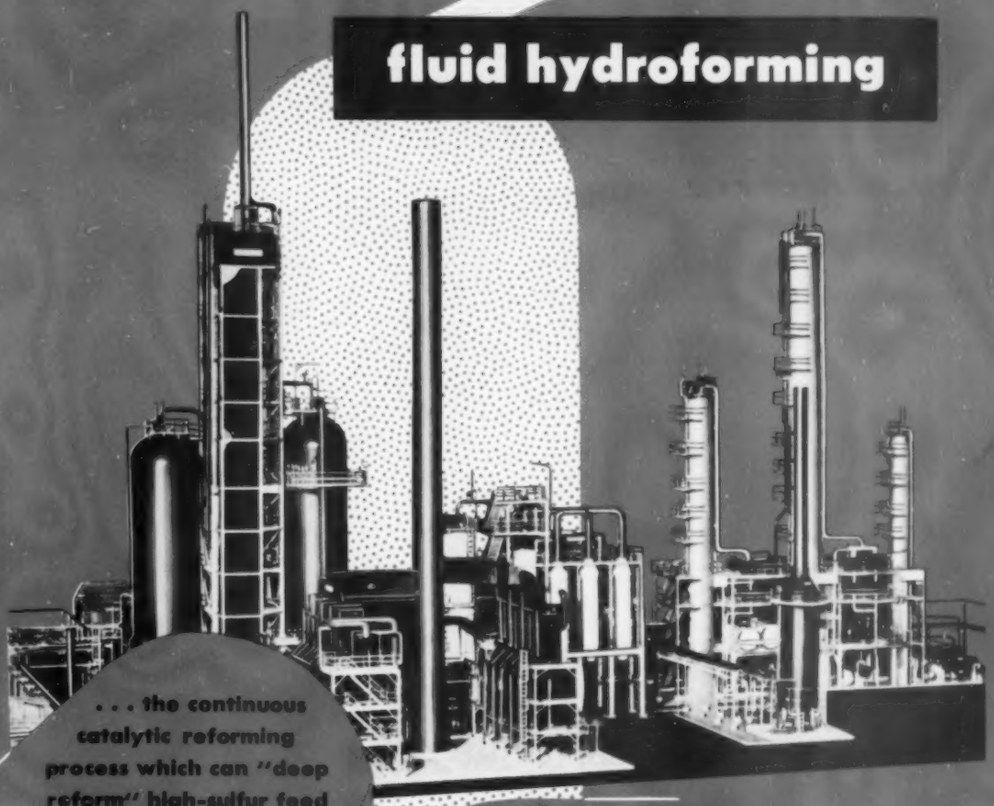

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Now, the model . . . and in early 1955 . . . the completed plant:—the Fluid Hydroformer now being built by Foster Wheeler for the Creole Petroleum Corporation.

This Fluid Hydroformer is part of an expansion program at "Creole's" Amuay Bay, Venezuela refinery for which Foster Wheeler is the main contractor; also included are a 75,000 bbl/day Crude Distillation unit, a Naphtha Fractionation-Stabilization unit and extensive offsite facilities.

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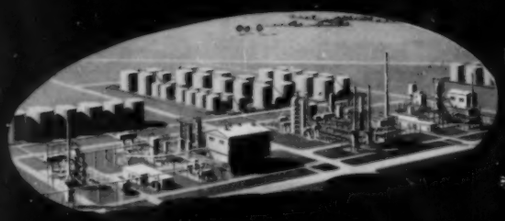

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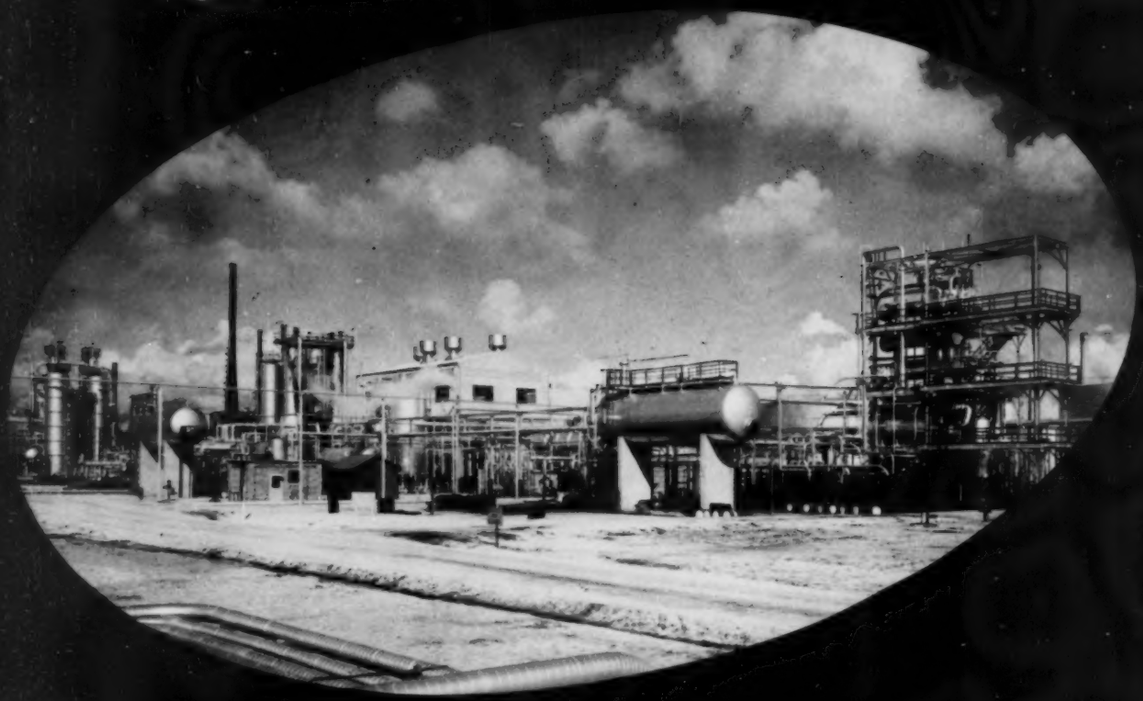

the Fawley lube plant

Designed and constructed by Foster Wheeler, in collaboration with the engineering department of the Standard Oil Development Company, this plant, comprising Propane Deasphalting and Dewaxing, Phenol Solvent Refining and Clay Contact Rerun units, is daily turning out superior lubes for British industry.

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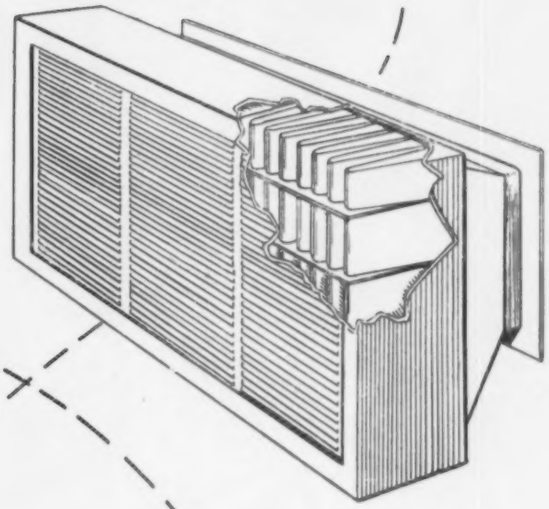

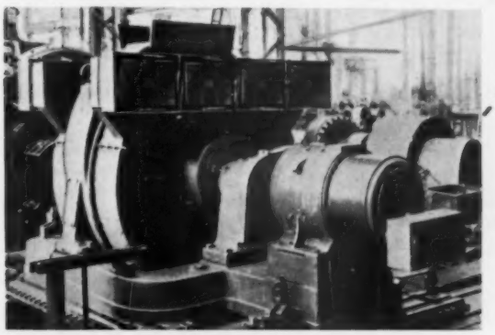

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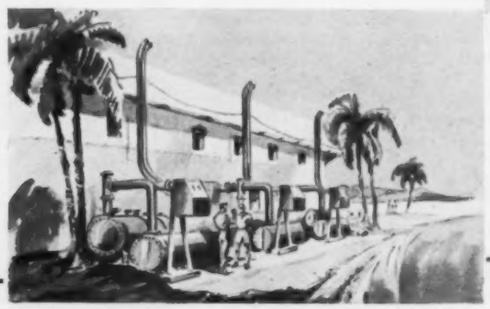

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OIL COMPANY STAFF CHANGES

E. L. GORHAM, JR., has been named manager, joint operations, of The Texas Company's foreign producing department, it has been announced by J. T. Wood, Jr., vice president of the company's foreign operations department (Western Hemisphere and West Africa).

Mr. Gorham, whose new headquarters will be in New York, was formerly assistant manager, Venezuelan division, of the Texas Petroleum Co. in Caracas. He first joined Texaco in October 1935 and was a field foreman of the company's South Texas division prior to his transfer to Venezuela in February 1939. He has been assistant manager, Venezuelan division, of the Texas Petroleum Co. since February 1947.

GEORGE T. PIERCY has been named assistant general manager of the supply department and J. M. Shivers to succeed him as manager of the refining coordination division of Esso Standard Oil Co. Mr. Piercy succeeds Thomas W. Moore, who has been transferred to the parent organization, Standard Oil Company (N.J.). Mr. Shivers will transfer from the Baton Rouge refinery, where he was manager of the refinery crude and marketing division.

C. MISHOU of Shreveport, Louisiana, has been named general manager of the Minnesota Pipe Line Co. He was formerly assistant to the manager, southern division, Interstate Oil Pipe Line Co. Minnesota Pipe Line Co. is constructing a 16-inch, 260-mile pipe line from Clearbrook to Hastings, Minn., to be completed in 1955 to serve the southern refinery of Great Northern Oil.

M. HALPERN, vice president in charge of refining for The Texas Co., has been elected senior vice president, a new executive post.

J. S. Worden, former general manager of refining, has been elected vice president in charge of refining, succeeding Mr. Halpern.

F. H. Holmes, former assistant general manager of refining, has been elected vice president in charge of the research and technical department, also a new executive post.

T. E. Buchanan, general manager of the marine department, has been elected a vice president.

Mr. Halpern joined The Texas Co. in 1916 as an assistant civil engineer at the Bayonne, N. J. refining terminal. He was transferred to New York in 1930 as assistant manager of the refining department. He became general manager in 1938, was elected a vice president in 1940 and director in 1946.

Mr. Worden joined Texaco in 1921 at its West Tulsa, Okla. refinery and was later made assistant superintendent of that refinery. He has also been superintendent of the Amarillo, Houston, and Lawrenceville, Ill., refineries, superintendent of construction and maintenance of the Port Arthur, Texas, refinery and vice president and general manager of the Indian Refining Co. He was made assistant manager of the refining department in 1940, manager of operations in 1942 and general manager in 1950.

Mr. Holmes has worked for Texaco since 1927. He has held supervisory positions at refineries both in the United States and abroad. He was made assistant manager (operations) of the refining department in 1950, and in 1953 became assistant general manager of the department.

Mr. Buchanan, a native of Louisiana, entered the employ of The Texas Co. in 1917. He resigned two years later and returned to Texaco in 1938 as assistant to the chairman of the board and in 1939 was appointed general manager of the company's marine department.

SALVADOR TREVINO was chosen president of the Mexican Association of Mining and Petroleum Engineers and Geologists at an election meeting held in Mexico City's Geology Institute.

Other new officers of the organization are: Jesus J. Garcia Gandera, vice president; Jorge Nieto, first secretary; Jesus Garcia Guerrero, second secretary; Salvador Cortes Obregon, first assistant secretary; Eduardo Mapes, second assistant secretary; Ernesto Kisaner, treasurer; and Salvador Ulloa, assistant treasurer.

H. J. POLK, formerly of Creole Petroleum Corp., has joined International Refineries, Inc., Wrenshall, Minn. as assistant to the vice president and general manager. He will head up the crude oil and pipe line departments. Mr. Polk was with standard companies for many years before joining International. For the last 20 years he has been in Latin America engaged in producing and refining activities.

T. L. Wark

C. R. Brown

THOMAS L. WARK has been made general manager of the western division of Tide Water Associated Oil Co. and Charles R. Brown has been made assistant general manager. Both are vice presidents of the company.

Mr. Wark joined Tide Water 34 years ago as resident geologist at Ventura, Calif. Since 1937 he has been in charge of the western division production department. He was appointed a vice president in 1946.

Mr. Brown, who has been in Tide Water's service since 1917, has served in various capacities in the company's administrative department, including administration of the company's overall industrial and public relations activities. He has been a vice president since 1948.

R. L. MINCKLER, president of General Petroleum Corp., recently completed 30 years of service with the company. He joined the comptroller's department of the company in 1924, became assistant to the president in 1934, and a director in 1941. He has been president since 1948.

A. N. GRIFFITH is the directing engineer in charge of Nigerian operations for Nederlandse Boormaatschappij N.V. This company is contracting for Shell D'Arcy and their present Nigerian mailing address is c/o Shell D'Arcy, Port Harcourt, Nigeria, British West Africa.

Mr. Griffith was in charge of the Carter Oil Company's rotary rigs before joining Nederlandse Boormaatschappij and, before that, was drilling superintendent for Texas Pacific Coal and Oil Co.

BRUCE SCRAFFORD has been elected president of Highland Oil Co. and Frio Pipe Line Co., Houston. Mr. Scrafford has been vice president of the Highland company since June 1, 1952 and his election as president of the three companies followed the resignation of Virgil A. Brill. Mr. Scrafford will also serve as general manager of the Herman Brown and George R. Brown Oil Division. Robert D. Hendrickson, former chief geologist with Highland, has been elected vice president of the companies.

J. THURMAN GREEN, former director of safety for Sun Oil Company's production department, has been named to organize and conduct a safety program for Sun Pipe Line Company's crude lines department at Beaumont.

Mr. Green, who joined Sun as a field employee over 20 years ago in East Texas, has been safety director for its production department since 1937 with headquarters in Dallas. His successor there has not yet been named.

C. E. BEECHER, Cities Service Oil Company, Bartlesville, Okla., has been elected president of Drilling Research, Inc. to succeed C. P. Dimit, who resigned due to ill health. Mr. Dimit had held the position of president since the organization was formed in 1948. Drilling Research, Inc. was formed to develop new methods and apparatus for drilling oil and gas wells and currently is preparing to field test a new drilling apparatus.

HARRY B. CATLOW has been appointed executive vice president of Bellco Industrial Engineering Co. of Houston, according to an announcement released by Warrer. S. Bellows, president. Since 1942 Mr. Catlow has been with Republic Supply Co. and only recently resigned as vice president in charge of sales for that organization.

C. F. COFFIN has been named industrial relations manager at General Petroleum's Torrance, Calif. refinery. He will also be concerned with the manufacturing department's operations in Vernon.

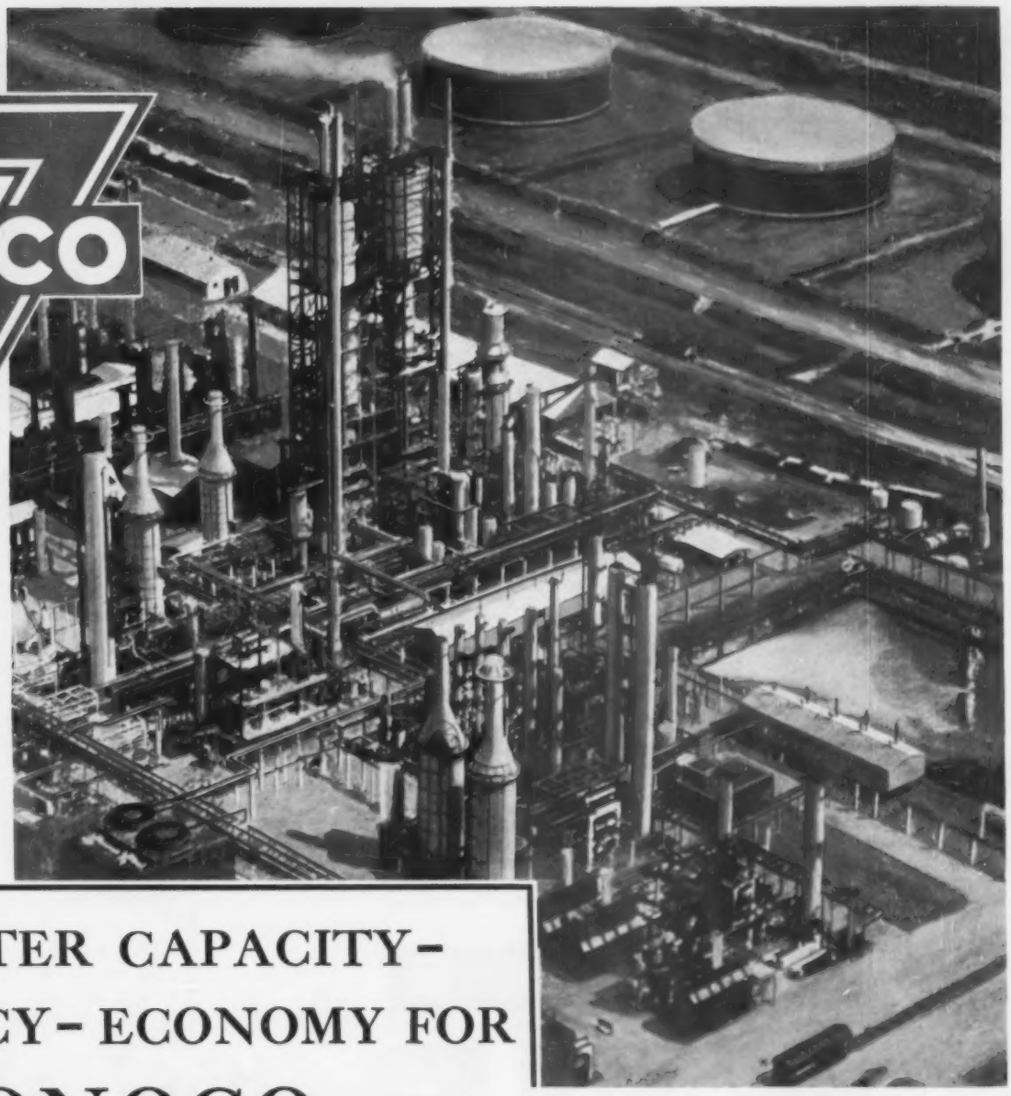
M. Halpern

J. S. Worden

F. H. Holmes

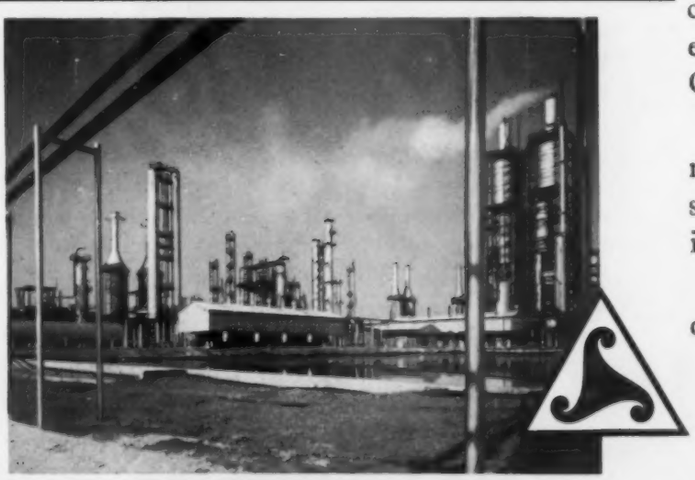
T. E. Buchanan

CONOCO



New installations recently placed in operation at Lake Charles, include units for crude oil distillation, catalytic cracker feed preparation, Thermofor catalytic cracking, gas recovery, catalytic polymerization, catalytic reformer feed preparation and aromatics extraction.

GREATER CAPACITY- EFFICIENCY- ECONOMY FOR CONOCO



For Continental Oil Company, Stone & Webster Engineering Corporation designed and constructed seven types of process units and enlarged an existing alkylation unit at the Company's Lake Charles, Louisiana, refinery.

Continuous flow through several of the units minimizes the need for intermediate offsite storage facilities; and all units are closely integrated for high heat economy.

These new units more than tripled the capacity of the refinery.

Write or call us for detailed information as to how our engineering, design, construction, report and appraisal services may be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

BADGER PROCESS DIVISION

AFFILIATED WITH E. B. BADGER & SONS LIMITED (LONDON)

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Toronto

CHARLES C. FRYE has been appointed chief engineer of Hudson's Bay Oil and Gas Company Ltd., Calgary. Mr. Frye joined Continental Oil Co. at Ponca City, Okla. in 1933 as a petroleum engineer. In 1948 he became regional petroleum engineer for Conoco at Denver, which position he held at the time of his transfer to Calgary.

C. B. SMITH, JR., Casper, Wyo., division geophysicist for Continental Oil Co., has been appointed acting assistant regional geophysicist for the company's Rocky Mountain region, with headquarters in Denver, C. M. Ferree, Denver, geophysical supervisor for Conoco, has been appointed acting division geophysicist at Casper succeeding Mr. Smith.

JAMES T. MAHER has been appointed general staff assistant in public relations for The Texas Company. For the past four years, he has been a member of the public relations department of Cunningham and Walsh, Inc., New York City advertising firm, where he handled Texaco's technical and product publicity.

KIM G. HOUGHLAN has been named director of public relations of Platte Pipe Line Co. He was formerly assistant to the president. He joined Platte in October 1950 as administrative assistant to the vice president after 20 years' service with the Sinclair Oil Co. in its gasoline and pipe line departments.

CHARLES F. GATES has been advanced to chief production engineer for General Petroleum Corporation's production department. Mr. Gates first joined General Petroleum in 1938 and in 1949 became senior production engineer at Vernon, Calif., the post he held until his promotion.

D. E. LEWIS has been named division solicitor of Imperial Oil's western producing department. He succeeds G. W. Robinette, who has been transferred to the company's office in Toronto.

Mr. Lewis joined Imperial in 1948, two years after his army service in World War II. Since the war he has served in the Canadian army reserve, and is presently a Major on the staff of the 18th infantry brigade. Last year he received the coronation medal and the Canadian efficiency medal for his work with the reserve forces.

GEORGE W. MARSHALL, JR., who has been associated with Continental Oil Company's oil and gas exploration since 1948, has been promoted to regional geologist for Conoco's southwestern region, with headquarters in Fort Worth. He succeeds W. O. Ham, Jr., recently promoted to assistant regional general manager.

RUSSELL D. RICHARDSON has been appointed controller of Tide Water Associated Oil Co. with headquarters in San Francisco. For several years past he has been regional controller of the company's western division.

ROBERT M. MILLIKEN has been appointed superintendent, traffic department, for Royalite Oil Co. (Ltd.). He is a railroad man of long experience who recently retired as general freight agent for the C.N.R. at Winnipeg.

LYNN D. ERVIN has joined Geophysical Consultants, Inc., seismograph contractors of Tulsa, as a vice president. Until recently Mr. Ervin was division geophysical supervisor for Stanolind Oil and Gas Company's central division. Prior to that he held the same position in Stanolind's Rocky Mountain division.

D. E. Lewis

L. D. Ervin

WEIR

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FEED PUMPS
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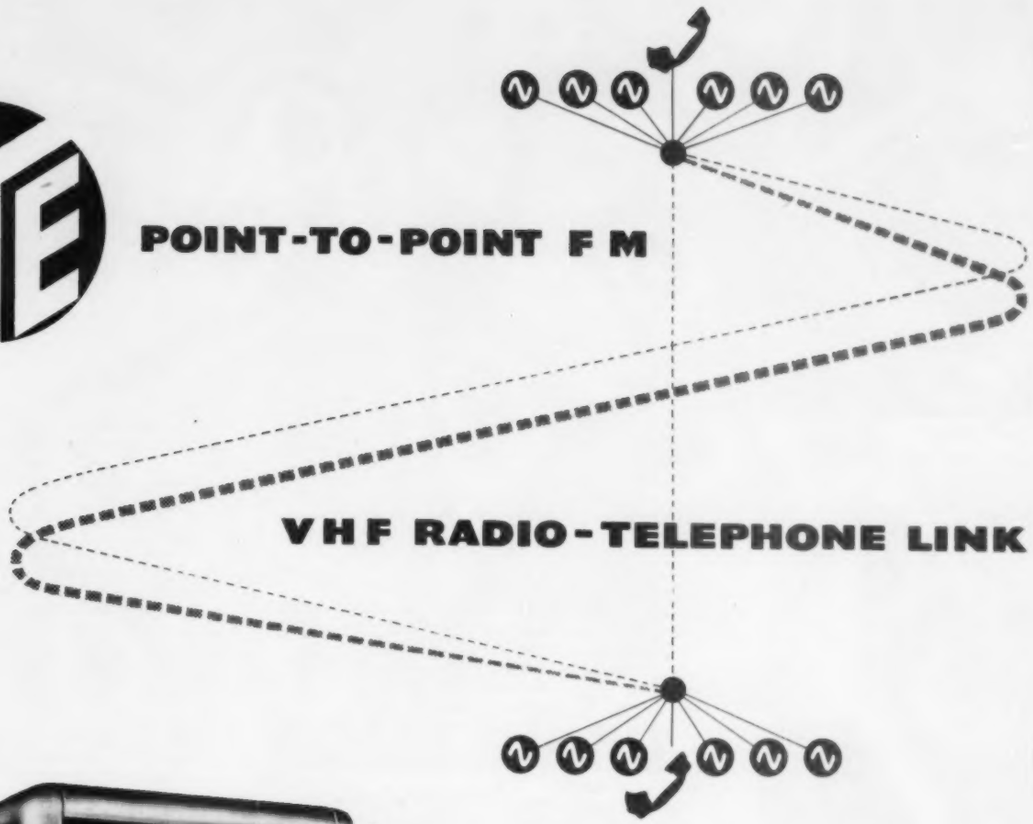
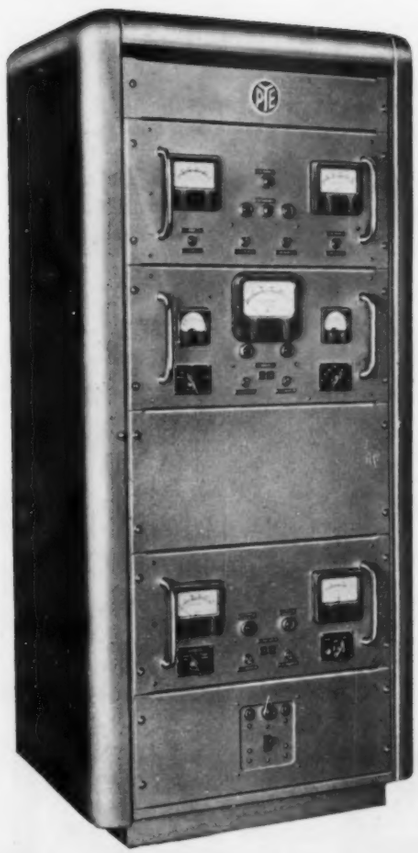
and
HEAT EXCHANGERS

Heat Exchangers for all duties. Crude-to-Residue Exchangers, Side Stream Exchangers, Oil Coolers, etc. Vapour Condensers for vacuum, topping or cracking plants. Final Condensers (water circulated) and Partial Condenser (circulated with incoming crude). Weir Refinery Equipment includes Oil Pumps for all duties, Steam Ejectors for Vacuum Stills, and all auxiliaries for Feed pumping and Feed heating. Write for Catalogue Section IL.8 "Weir Pumps for the Oil Industry" and Publication No. IL.38 "Weir Power Plant Auxiliaries."

G. & J. WEIR LTD
CATHCART : GLASGOW

POINT-TO-POINT F M





This equipment will provide first-class single channel point-to-point facilities and, at the same time, possesses the necessary capacity for extension to six channels if required.

ABBREVIATED SPECIFICATION

Frequency range: 60—216 mc/s
Transmitter output Power: 10 watts or with Amplifier Unit—50 watts
Maximum Deviation: 50 kc/s
Receiver Bandwidth: 6 db down ± 120 kc/s
Overall Transmitter-Receiver Performance
Frequency Response: 300 c/s—6 kc/s ± 3 db; 6 kc/s—36 kc/s ± 1 db
Intermodulation Level: At least — 55 dbm for 2 tones applied each at 0 dbm

Telecommunications
CAMBRIDGE ENGLAND

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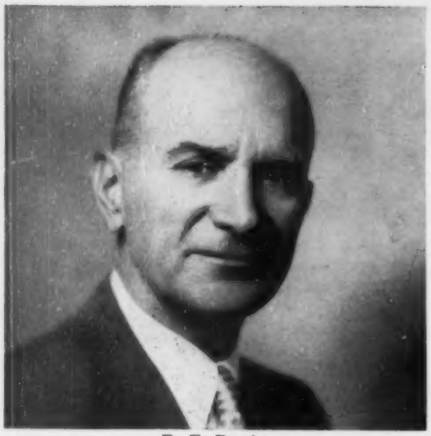
Pye Radio & Television (Pty.) Ltd., Johannesburg, South Africa.	Pye Limited, Plaza de Necaxa 7, Mexico 5.	Pye Limited, Tucuman 829, Buenos Aires.	Pye Limited, 5th Ave. Buildings, 200 5th Ave., New York.

PYE LIMITED · · CAMBRIDGE · · ENGLAND



D. E. Davis

W. M. Johnson

D. E. DAVIS, a 30-year veteran of the international petroleum industry, has been appointed manager of Standard-Vacuum Oil Company's producing department in New York. He succeeds E. W. Berlin, whose temporary assignment with Stanvac's operating subsidiary in Indonesia has been extended.

Mr. Davis started his oil career in 1923 as a roustabout and tool dresser with the Carter Oil Co. in Wyoming. Two years later he transferred to another Jersey Standard company in the Argentine, where he served successively as inventory man, production foreman and district superintendent in the San Pedro oilfields.

Joining the Stanvac organization in Indonesia in 1937, Mr. Davis was named assistant field superintendent in the Pendopo producing area of South Sumatra. During the war years of 1942 to 1945, he was employed by Creole Petroleum Corp. as assistant division engineer at Maracaibo, Venezuela.

With the exception of a two-year assignment in Indonesia, Mr. Davis' postwar service with Stanvac, 1945-1954, has been in the New York office. He was named assistant manager of the producing department in 1949 and has been acting department manager for the past year.

WILLIAM M. JOHNSON has been appointed to the newly created post of executive assistant to the vice president of Shell Oil Company's New Orleans exploration-production area.

E. J. McLain, New Orleans area land agent, succeeds Mr. Johnson as land manager; Fred A. Porter, New Orleans area land agent, becomes Baton Rouge division land manager; and Edward C. Abell, division land manager at Baton Rouge, moves to the New Orleans office as area land agent.

Mr. Johnson joined the Shell organization in June 1925, was appointed assistant land manager in Houston in 1936, and when Shell's New Orleans area was formed in 1946, was named land manager there.

PAUL E. HURLEY has been made manager of Shell Oil Company's Houston refinery. He has been manager of the company's refinery at Norco, Louisiana since 1945. He succeeds M. P. L. Love, soon to begin a special assignment abroad.

The new appointment is the latest in a long series of advances during Mr. Hurley's 34 years with Shell. He started to work for the company as a gauger at the Wood River, Illinois refinery in 1920, and rose through the ranks to become superintendent of the Norco refinery in 1938. He was acting superintendent of the Houston refinery from 1942 to 1945, when he returned to Norco to become manager.

Roy W. Faulk, superintendent at the Norco refinery for the last year and a half, will succeed Mr. Hurley as manager there.

JOSEPH A. THOMAS has been elected director of Tide Water Associated Oil Co. He is a partner of Lehman Bros., New York investment bankers, and a director of many corporations, including American Export Lines, Flintkote Co. and National Airlines, Inc. Mr. Thomas replaces John Hertz, also a partner of Lehman Bros.

L. CLAUDE ROARK and **PARK G. OGDEN, JR.** have been appointed to the geological staff of Buffalo Oil Co. They will work under the supervision of John L. Ferguson, recently named manager of exploration. Mr. Roark will become geologist in charge of the Tulsa exploration offices and Mr. Ogden will hold the same post at Lafayette, Louisiana.

DR. NOYES D. SMITH, director of Shell Development Company's exploration and production research laboratory in Houston, Texas, has been elected a vice president of the company. He has been with Shell since 1935. In 1951 he became research manager of the technical department and was promoted to the directorship last year.

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The Thornycroft Organisation is serving the Oil Industry in its many and varied operations. Heavy duty "Mighty Antars", as illustrated above, have proved their worth and are well known in the Middle East — as elsewhere — 4 x 4 "Nubians" carry men and survey equipment across virgin terrain, and Thornycroft built craft — tugs, tenders and work boats of all types — are operating in waters throughout the world.

TANKERS, TRAILERS AND TRUCKS FOR RESEARCH UNITS.

PERSONNEL LAUNCHES, WORK BOATS FOR LAKE, RIVER AND OFF-SHORE TRANSPORT.

POWER PACKS FOR PUMPING AND GENERATING.

We are exhibiting on Stand No. 121 at the British Trade Fair, Baghdad, October 25th - November 8th.

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Dr. G. S. Schaffel

Brea Research Appointee

Dr. G. S. Schaffel, formerly with General Tire and Rubber Co., has been appointed manager of research for Brea Chemicals, Inc., subsidiary of the Union Oil Co. of Calif. Dr. Schaffel joined General Tire in 1946, where he served as an executive both in chemical research and in chemical production until his recent appointment.

Corrosion Abstracts

A 346-page book containing 3,512 abstracts of articles and books on corrosion has been published by the National Association of Corrosion Engineers, 1061 M & M Building, Houston 2, Texas. The articles are from more than 500 periodicals published all over the world and are abstracted by some 30 agencies that authorize NACE to use their abstracts.

Aromatics Plant on Stream

With the completion of extensive new process units, Continental Oil Company's refinery at Lake Charles, La., has become the first refinery to extract benzene, toluene and xylene simultaneously from petroleum by the liquid sulfur dioxide process. The refinery expansion, costing over $16 million, was designed and constructed by Stone & Webster Engineering Corp. and is now operating at full production.

The benzene will be used by Continental in the production of a synthetic detergent while the toluene-xylene fraction will be largely utilized in aviation gasoline.

Opens Denver Office

Seaboard Oil Co., Dallas, Texas has established western division headquarters in Denver, consolidating division offices formerly maintained in Los Angeles and Casper. N. A. Rousselot, vice president and manager of the western division will be in charge. Other personnel include: A. W. Vitt, manager of exploration; H. H. Lawson, manager of land department; C. B. Kimberlin, manager of production; and O. L. Beasley, purchasing agent. Temporary offices are located in the Central Bank Building and permanent offices will be in the Denver Club Building upon its completion this Fall. District offices will be maintained in Los Angeles, Billing, Mont., and Calgary, Alberta.

Heads Chicago Bridge Advertising

The Chicago Bridge & Iron Co. has announced the appointment of E. N. Zimmerman as advertising manager, effective July 21.

Mr. Zimmerman started with the Chicago Bridge & Iron Co. in 1937 and worked in their Greenville, Pa., drafting room, plant, and purchasing department before being transferred to Chicago in 1945 as assistant advertising manager.

E. C. Oden

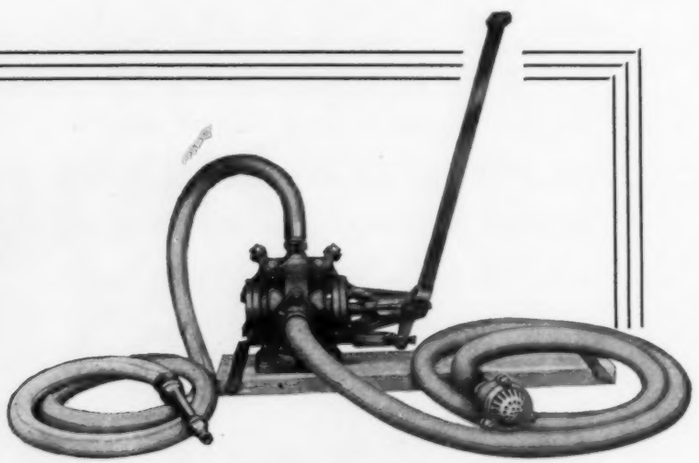
Establishes Consulting Service

E. Clarence Oden has resigned his position as chief process engineer of Cities Service Refining Corporation to establish a consulting service in Lake Charles, Louisiana.

After obtaining degrees in chemical engineering from the University of Alabama and Polytechnical Institute of Brooklyn, Mr. Oden engaged in graduate studies at Cornell University and University of Michigan. He was an assistant professor of chemical engineering at Michigan State College in 1942-43. Since then he has been engaged in research, development and operational activities in the chemical and petroleum industries. For the past ten years he has been connected with the Cities Service organization and since 1948 has been chief process engineer at the company's Lake Charles refinery.

ZWICKY

PUMPS



HIGH DUTY HAND PUMP
WITH BASE PLATE FILTER

Universally adaptable for all fluids — High volumetric and mechanical efficiency — Spring loaded packing, easily replaced — Zwicky gauze type filter forming base on suction side.
Output up to 1200 gals. per hour.

HIGH DUTY
PORTABLE HAND PUMP

Important features: Universal adaptability for all fluids — Mounted on hard wood platform — High volumetric and mechanical efficiencies — Outputs up to 1200 gals. per hour.
Complete with hoses, nozzle and strum box.

Zwicky Ltd., TRADING ESTATE, SLOUGH, BUCKS. ENGLAND.

Telegrams and Cables: "ZWIKLIM, SLOUGH"

POWER AND HAND PUMPS, MICRON FILTERS, PATENT HOSE REELS, SPECIALISTS IN PUMPING AND FILTERING EQUIPMENT

Exhibiting at Farnborough Show — Stand No. 242.

the development and use of foam

AND FOAM GENERATING EQUIPMENT

ITS ORIGIN. We are the pioneers of the development and manufacture of mechanical foam-making compound in this country. "Pyrene" Foam Compound in its original form was adopted by the British Fire Services and Armed Forces for fighting wartime oil and spirit fires. Since then, intensive research in the Pyrene Laboratories has led to the development of a greatly improved Standard Compound, supplemented by several additional grades to meet specific requirements — including "Pre-mix" Compound.

TYPES OF FOAM COMPOUND AND THEIR USES. "Standard" Pyrene Foam Compound is widely used in all parts of the world, especially with Pyrene Portable and Fixed Foam Equipment and motor-driven Tenders, to protect oil refineries, tank farms and various industries against major oil and spirit fire risks. "Pre-mix" Compound is used in the form of a ready-mixed solution in self-contained foam units, where a suitable water supply is not available. Special arrangements can be made for installations involving the use or storage of alcohols.

PROPERTIES. All types of "Pyrene" Foam Compound have been developed to give maximum heat resistance, a high degree of heat insulation, exceptional water retention and free-flowing movement. The combination of these specific properties in this Compound enables it to produce the finest fire-fighting foam possessing exceptional qualities of tenacity and stability.

PARALLEL DEVELOPMENT WITH SPECIAL FOAM EQUIPMENT. As the largest manufacturers of foam fire-fighting equipment we have at our command laboratories, research departments and all modern production facilities. We are therefore able to offer a wide range of foam generating equipment designed to operate at maximum efficiency *expressly* with "Pyrene" Foam Compound. This equipment includes foam-making branchpipes, mechanical foam generators, in-line and multiple-jet inductors, foam proportionators, monitors, portable foam towers, foam tenders and airfield crash tenders. Both the compound and these appliances have been developed and tested in conjunction with each other at every stage, thus ensuring maximum performance at all times when used together.

WHERE PYRENE COMPOUND IS USED. "Pyrene" Foam Compound is supplied in large quantities to many leading oil companies as well as the Royal Navy, the Merchant Navy, the Royal Air Force, the Army, British Fire Services, large industrial and commercial organisations, municipal Authorities, nationalised industries and airfields all over the world.

HOW WE CAN HELP YOU. Whatever the fire-fighting problem —and particularly where foam is indicated — the co-operation of our Fire Engineers is always at your disposal.

Pyrene TRADE MARK FIRE FIGHTING EQUIPMENT

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IF ROPE COULD TALK . . .

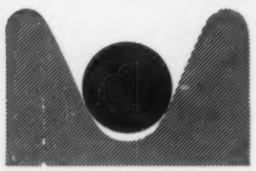
"Stop pinching me, you pulley!"

You can't punish ropes **and** expect to get the best out of them. So watch your PULLEYS and SHEAVES.

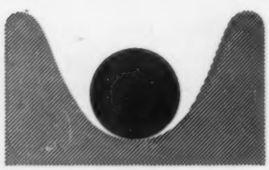
The radius of the groove of a pulley should always be slightly larger than that of the rope passing over it. If the groove is too narrow, it will crush the rope and soon damage the wires.

If too wide, the rope not only wears more quickly at the point of contact but also cuts a false groove in the pulley.

With sheaves, oil the bearings at frequent intervals and check that they rotate freely. A seized up sheave can ruin a rope very quickly. Watch alignment too; see that sheaves, drums and pulleys are set exactly in line with the rope that is working over them.



WRONG
Pulley groove too narrow.



WRONG
Pulley groove too wide.

RIGHT
Pulley groove correct—supporting the rope for 1/3rd. of its circumference.

Write for a copy of a new booklet "If Rope could Talk."

Pin up this announcement where your staff can see it. *It is issued in the interests of longer rope life by*

British Ropes Limited

HEAD OFFICE: DONCASTER
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Wide range — All types.
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The widest range in the British Empire — made to suit your requirements.
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Turbine driven up to 11,000 KW.
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Hundreds in hand.

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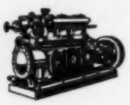
REFRIGERATING PLANT



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High Speed Vertical
up to 500 B.H.P.
Over one hundred in hand.

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PLANT TO CUSTOMERS' OWN DESIGNS
WHY NOT SEND YOUR PROBLEMS TO US?
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COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

Backed by 75 Years of Petroleum Progress

The World's Most Famous Motor Oil

In seventy-six countries throughout five continents VEEDOL reigns supreme among motor oils. From teeming world capitals to loneliest desert outpost the name VEEDOL spells *quality motor oil.*

Refined from the finest of crudes to be found in the world, this great motor oil protects vital parts, conserves power and prolongs the life of engines in every kind of vehicle propelled by automotive power.

The story of VEEDOL is the story of three-quarters of a century of petroleum progress. Building pipelines, sinking wells, building refineries, the producers of VEEDOL have grown from a tiny enterprise in America's first oil field to a major oil company with producing facilities in a dozen different states and distributing centers throughout the entire world.

VEEDOL, the product of three-quarters of a century of experience and accomplishment in every phase of petroleum production, refining and blending, is a motor oil you can use with confidence for *all* your driving in any kind of motor vehicle.

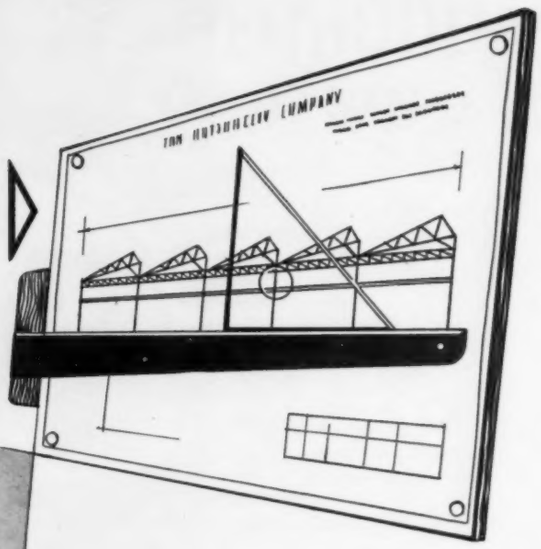
TYDOL

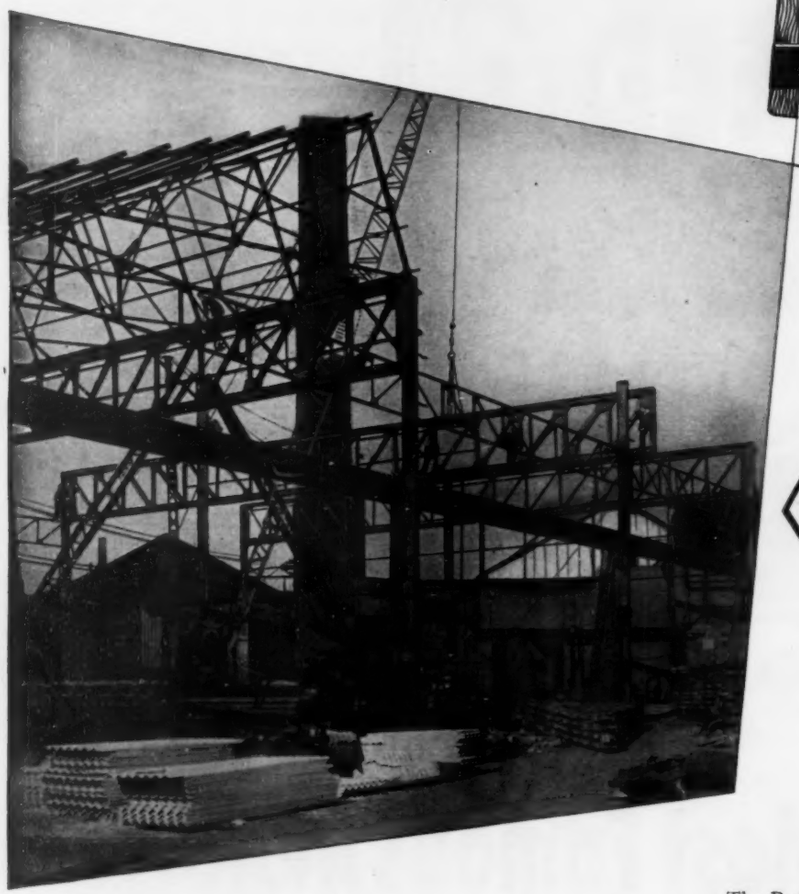
TIDE WATER ASSOCIATED OIL COMPANY

New York Tulsa San Francisco

FEDERAL

from drawing board





to erection on site

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The Butterley Company has been engaged in constructional steelwork from its early days and examples are to be found in all parts of the British Isles and in many countries overseas. From design, through the stages of fabrication to erection on site, every structure is invested with the skill and knowledge which have made the Butterley Company famous in the field of constructional steelwork. Welded methods are widely employed today and the shops are well-equipped to undertake the largest and heaviest work of this nature.

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CS-37

Crane Development Series—I

CF 2

Four years ago, in London, we staged a special combined Demonstration-Exhibition-Press Conference, in order to introduce a range of products which we designated CF2. CF2 is the recurring formula of a polymerised plastic, at the time an entirely new material, called polytetrafluoroethylene, or PTFE as it has become known.

Primarily we were interested in PTFE because a range of completely chemically inert Gland Packings was very badly needed to seal against the increasingly corrosive substances being used by the Processing Industries. These Gland Packings were also required by the Chemical and allied Industries which are responsible for the manufacture of these substances. In this particular field PTFE proved itself to be a remarkable material and we have been very active in developing it in various useful forms for use by these Industries.

But, as the illustrations on this page show, this was only a beginning; since we first introduced PTFE in the form of Gland Packings we have gained considerable experience of the manufacture of various products from the basic raw material, and we have now used this material for many new, and in many cases entirely unsuspected, applications.

We are preparing a special series of pamphlets on our work in these fields. These pamphlets will be of interest to all concerned with the handling of these *problem* materials, and they will be sent to interested engineers who let us have their names and addresses.

An announcement by

Crane Packing LTD OF SLOUGH ENGLAND

A 71 COMPANY

Jet Action of Blow-down Valve

Unless foundations are properly designed, the "jet" action of gas line blow-down valves can seriously damage a piping system, according to field reports by engineers of Rockwell Manufacturing Company's meter and valve division. When the valve is opened, the gas issues into the atmosphere at the velocity of sound. In a recently investigated case, Rockwell reports, the jet effect amounted to the equivalent of 16,000 hp.

To avoid severe damage to the blow-down system resulting from this phenomenon, it is necessary to design and install a foundation that can "take" the reactive force. The jet effect is most severe at the beginning of the blow-down period: as the line pressure decreases to zero, so does the jet effect. In designing the foundation, account should be taken of the maximum force exerted by the jet effect rather than taking an average figure for the force during the entire blow-down period.

Buy Ajax Pipe Line

Purchase of a 1,050-mile crude oil pipe line gathering and trunk system in Oklahoma from Interstate Oil Pipe Line Co., and two crude oil lines extending 395 miles from Glenn Pool, Okla., to Wood River, Ill., from Ajax Pipe Line Co. has been announced by W. Alton Jones, board chairman of Cities Service Co., and L. F. McCollum, president of Continental Oil Co. The Cherokee Pipe Line Co., of which Conoco and Cities Service each own 50 percent, has been organized to purchase the properties.

Plans call for conversion of parts of the two systems into an 8- and 10-inch products pipe line system. The products line system will then extend 582 miles from Ponca City, Okla., to the Oklahoma City area and to Wood River, just north of St. Louis, and will have an initial daily throughput of 22,000 barrels of petroleum products.

R. L. Hamilton

P. Edmunds

Elected Bechtel Vice President

Ray L. Hamilton has been elected a vice president of Bechtel Corp. He has been with the Bechtel organization for 14 years. Since 1953 he has been a vice president of Bechtel International Corp. and of Canadian Bechtel Ltd.

Among the major pipe line projects in which he has had a key role are the 645 miles of 30-inch crude oil line for Lakehead Pipeline Co. from Superior, Wis. to Sarnia, Ont.; also the 1,168-Trans-Arabian pipe line; Pacific Gas & Electric Company's "super-inch" 34-inch main line from the California-Arizona border to the San Francisco Bay area; and the 718-mile Trans Mountain Oil Pipe Line in Canada.

New Cities Service Tanker

The 38,000-ton supertanker SS Cradle of Liberty was launched at Newport News, Va., July 23, the third of four sister ships constructed for Cities Service Co. First of the four modern supertankers is the SS W. Alton Jones. The second ship is the SS Statute of Liberty. The fourth will be the SS Liberty Bell.

Edmunds Heads Davison Catalyst Sales

Appointment of Page Edmunds as general sales manager of the petroleum catalyst department of Davison Chemical Co. division of W. R. Grace & Co., effective August 1, is announced by D. N. Hauseman, vice president of Davison's marketing division. Mr. Edmunds succeeds Charles W. Saacke, who has resigned to become president of Commonwealth Oil Refining Co. of Puerto Rico.

Mr. Edmunds was successively in the technical service and industrial chemicals departments before joining the petroleum catalyst sales department, and in 1948 was appointed assistant sales manager.

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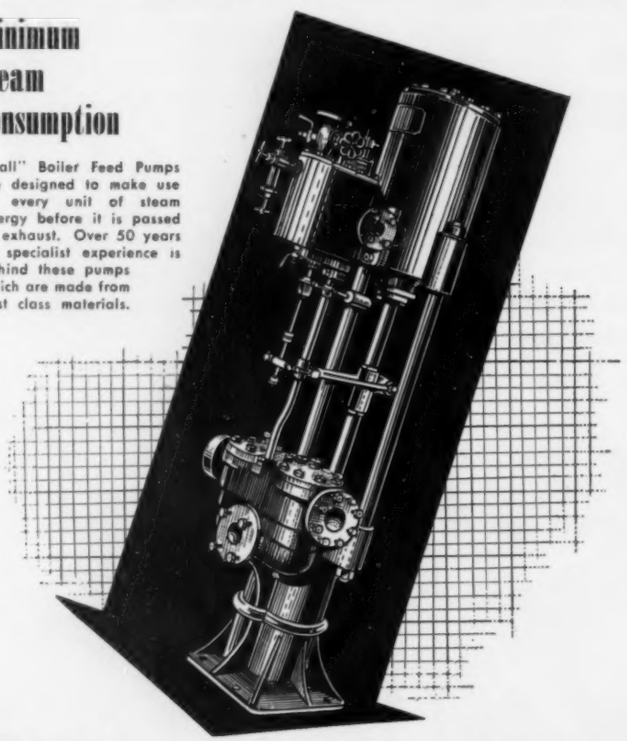

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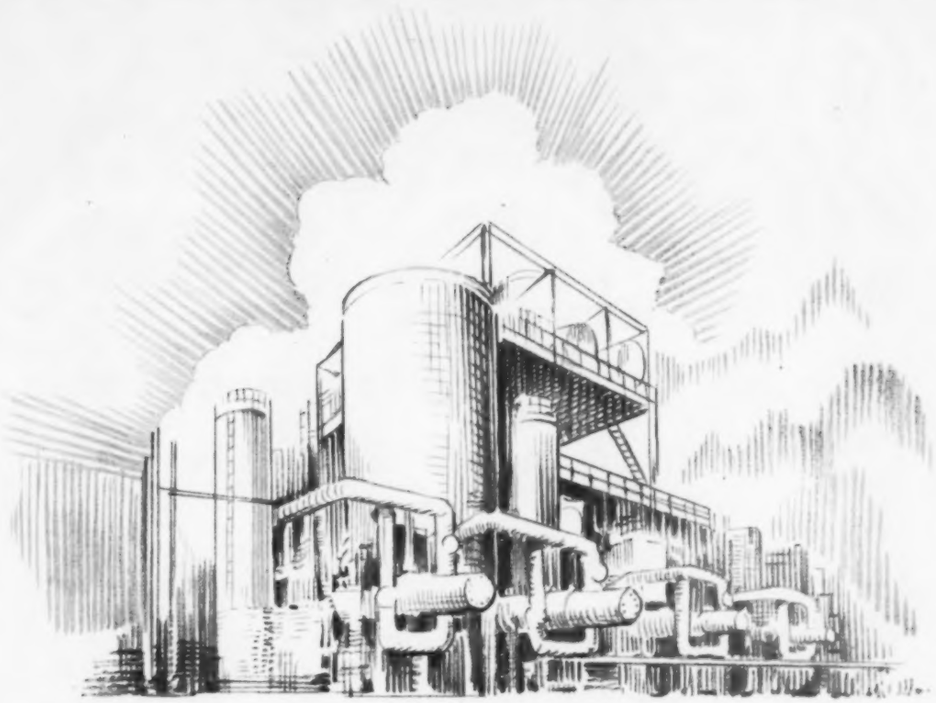

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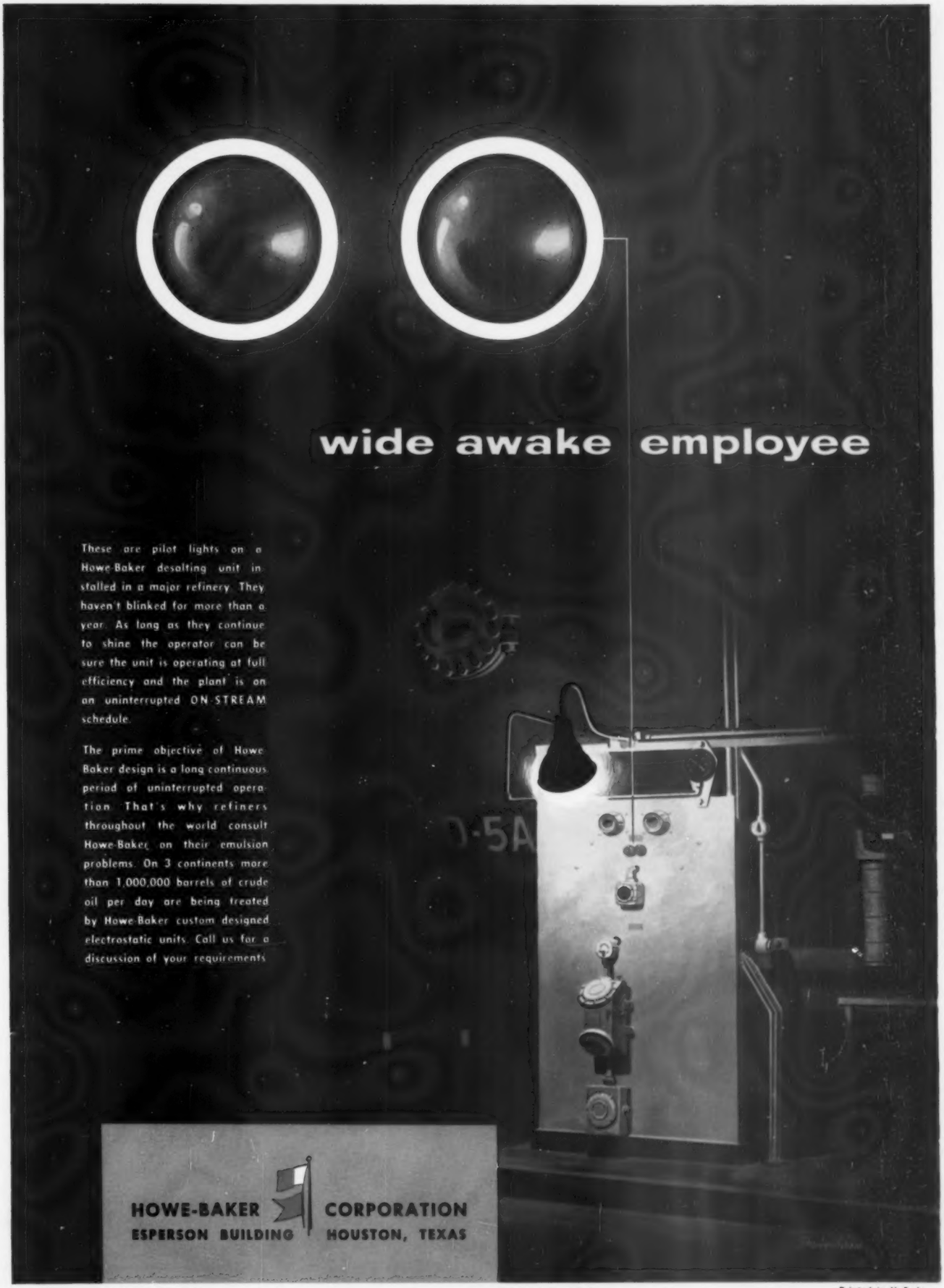
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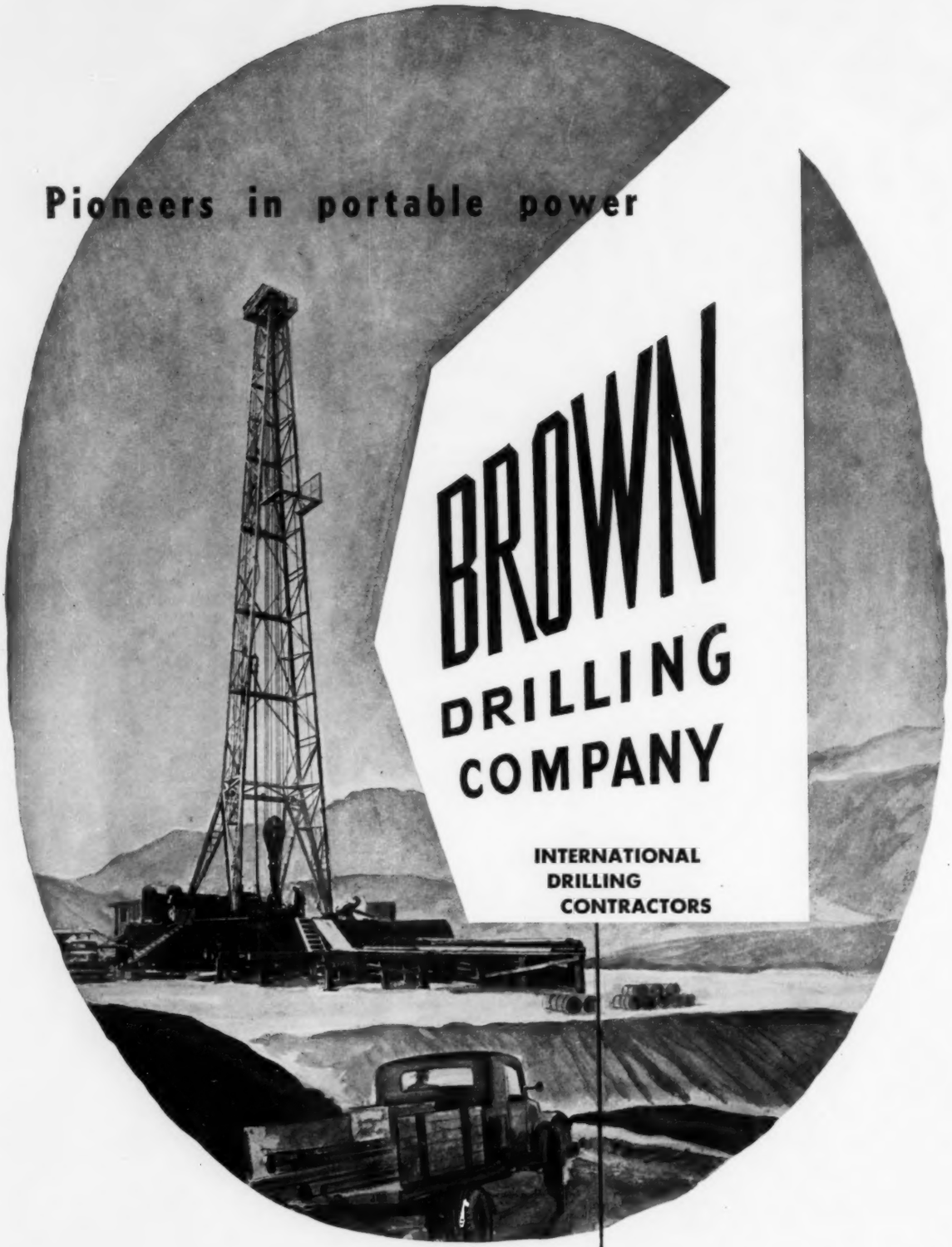

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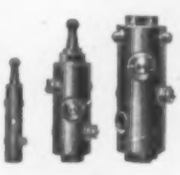

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Multiple Products Pipe Line Film Available for Showing

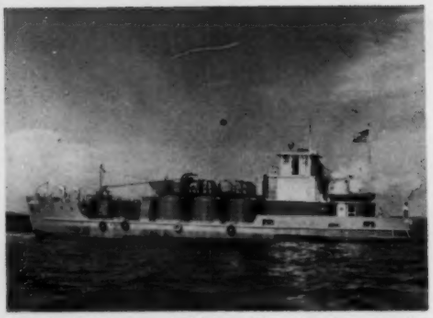
A new color-sound motion picture film prepared under the direction of Syd Smith of Shell Oil Co. and Rudy Lowe of Proportioneers, Inc., provides a dramatic tour of Shell's Wood River-Chicago multiple products pipe line. The film shows the various operations at the plant and demonstrates how time and space have been conserved by the modern methods used to blend, measure and transport petroleum in this new line. It is available by arrangement for private group showings and bookings are being made by Proportioneers, Inc., 345 Harris Ave., Providence, R. I.

Autofining Report

Autofining, a desulfurization process developed by the Anglo-Iranian Oil Company Ltd., is the subject of Kellogram No. 2, 1954, published by The M. W. Kellogg Co., a licensor for the process. According to the Kellogram, Autofining has been applied successfully to straight-run petroleum distillates in the gasoline of diesel fuel range, gasoline and kerosine fractions being almost entirely desulfurized with little loss of gas and coke. Removal of sulfur leads to better tetraethyl-lead response in gasoline, a reduction of char value in kerosine, and a better odor for both products.

To Dedicate Refinery

Standard Oil Company of Indiana will dedicate its new 30,000-barrel Mandan, N. D. refinery for processing Williston Basin crude oil on October 2. Gov. C. Norman Brunsdale of North Dakota will give the dedicatory address at public ceremonies. Dr. Robert E. Wilson, chairman, A. W. Peake, president, and other directors will take part.



The "Halliburton 207" making trial run after recent commissioning. One of the new features is aeration handling of bulk cement, moving the materials from the storage tanks shown amidships.

Second Cementing Ship in Service

The world's second ocean-going cementing ship, the "Halliburton 207," was commissioned and placed in operation recently by Halliburton Oil Well Cementing Co. Meanwhile, work has begun on a third, similar vessel for servicing marine operations. Unique design of the trio of ships, "206," "207" and the projected "208," allows them to cross an ocean with safety or navigate a shallow Louisiana bayou.

Each ship is self-contained with weighing and blending apparatus for handling bulk materials. Two Howco T-10 pumps — each operated by a 300 h/p diesel engine — give the "207" its cementing power. Each pump delivers from ten to twelve thousand pounds per square inch pressure. An AC pump for mixing is powered by a smaller diesel engine. Bulk capacity is the equivalent of 3,500 sacks. The newest of the ships, the "207," has a draft of seven feet, eight inches when fully loaded and a minimum draft of four feet, ten inches. Maximum speed is 13 knots.

Water Pressure Study

Getting the maximum amount of oil out of a well by use of the natural underground water pressure is the object of a study by Warren J. Mason published in the latest edition of the Quarterly of the Colorado School of Mines.

Besides describing the construction, the Quarterly includes illustrations of the experiments made by a special photographic process, basic equations, electrical diagrams, and much technical data. The Quarterly, Volume 49, Number 3, contains 36 pages and 14 illustrations, and may be secured from the Department of Publications, Colorado School of Mines, Golden, Colo., for $1.00 postpaid in the United States.

Ethyl Appoints New York Manager

Appointment of Redgnald D. Bushell as New York district manager of Ethyl Corp. is announced by Harold Berg, the company's general manager of antiknock sales. Mr. Bushell joined Ethyl in 1938 as a junior engineer. Two years later he was promoted to field engineer and worked out of Buffalo and then New York City in that capacity. His most recent position was that of accountant representative in Ethyl's eastern region.

Electric Equipment for Process Industries

A new bulletin, Electric Equipment For Process Industries, has been announced as available from the General Electric Company, Schenectady 5, N.Y. Designated GED-1966A, the 28-page publication provides detailed information on G-E electrical equipment for power generation, power distribution and conversion, power utilization, instrumentation, descriptive publications, and G-E service shops and warehouses, applicable to the process industries.

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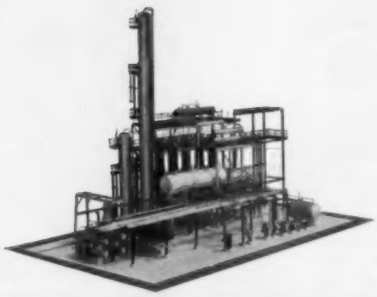

WATSON, CALIFORNIA. Fluor's part in the $40 million expansion program at Richfield Oil Corporation's refinery here, consisted of the engineering and construction of a polymerization plant (shown below), a super fractionation system (while changing the process), additions to the alkylation units, the erection of two giant Fluor Cooling Towers (18 cells each), and offsite facilities. A scale model complete in every detail of the poly plant was first built in Fluor's model shop and served as a useful guide during the engineering and construction stages of the actual plant. Because of difficulties presented by limited ground space at the refinery, Fluor set up engineering and drafting personnel right at the jobsite to expedite the job. Problems were solved "on location" to conserve time.

P. M. Bowen

Pure Elects Vice Presidents

P. N. Gammelgard, general manager of refining for the Pure Oil Co., and Dr. Kenneth M. Watson, director of research, have been elected vice presidents. Mr. Gammelgard joined Pure in 1934 as a trainee in the refining division. He first was a clerk in the mechanical department at the Toledo refinery. After distinguished service in the U. S. Navy, from which he retired to inactive duty as a commander, Mr. Gammelgard entered the refining division in the company's headquarters in Chicago. In March 1949, he became operations manager. On July 1, 1953, he became general manager of refinery operations.

Dr. Watson has worked in the petroleum industry for almost 20 years, and during the war his government service included the chairmanship of the technical committee of the Neches Butane Products Co., and consultant to the War Production Board.

Martin-Decker Appoints Foreign Representative

E. L. Decker, president of the Martin-Decker Corp., has appointed P. M. Bowen to the newly created position of foreign representative. Mr. Bowen has spent 33 years in the oil business as a driller, well-shooter, and tool pusher. Twenty-one of these years were spent in South America. He has a thorough knowledge of drilling installations all over the world and has hundreds of old friends in the oil business. He is also very active in the Nomads.

Cameron Iron Works Promotions

I. M. Baker has been appointed division sales manager for Mexico and South America for Cameron Iron Works valve and oil tool division. Mr. Baker was formerly division sales manager of the Houston division. His headquarters will continue to be at Houston. He has been succeeded by R. C. Brooks.

G. L. Teer, who until recently was division sales manager of the West Texas division, has been transferred to Calgary, Alberta, as division sales manager, Cameron Iron Works of Canada Ltd. Mr. Teer was replaced by T. G. Roscoe as Cameron's district sales manager in charge of the West Texas division.

P. N. Gammelgard

Dr. K. M. Watson

J. M. Gray

McCullough Promotes Gray

James M. Gray has been appointed assistant vice president of the McCullough Tool Co. He will remain in Houston, Texas, where he will assist in the administration of the eastern division of the company which is under the direction of O. J. McCullough, vice president. For ten years prior to joining McCullough in 1939 as eastern division credit manager, Mr. Gray was with the National City Bank of New York.

Tide Water Appointment

P. E. Allan, vice president in charge of marketing for the western division of the Tide Water Associated Oil Co., has been appointed administrative vice president for marketing, a newly created position. He will devote major time and effort to developing policies, plans and procedures.

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Behind Canadian-Parkhill Pipe Stringing, Ltd. is 33 years' experience in this industry, the last three years being devoted to work done entirely in Canada. This enables us to say that we can handle any hauling and stringing job in Canada.

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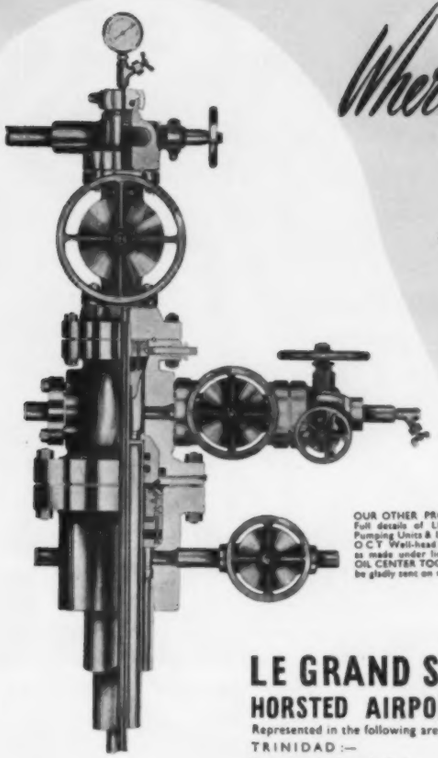

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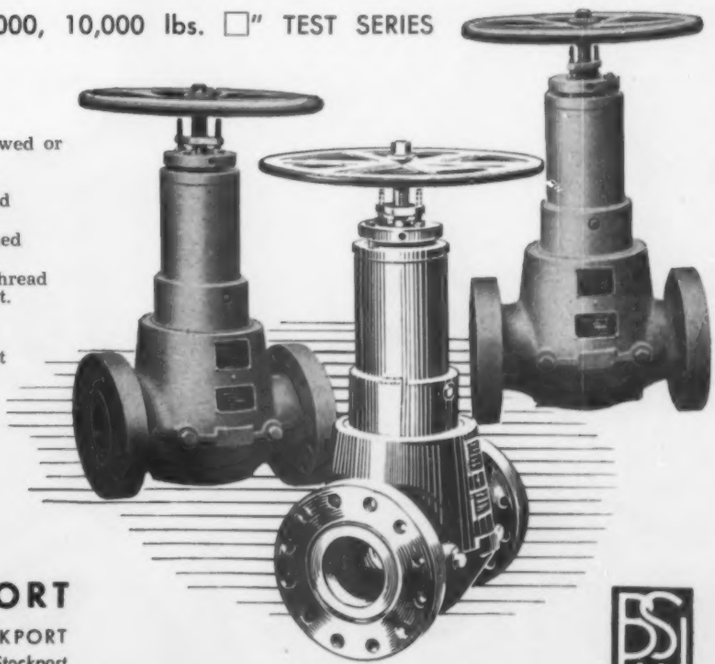

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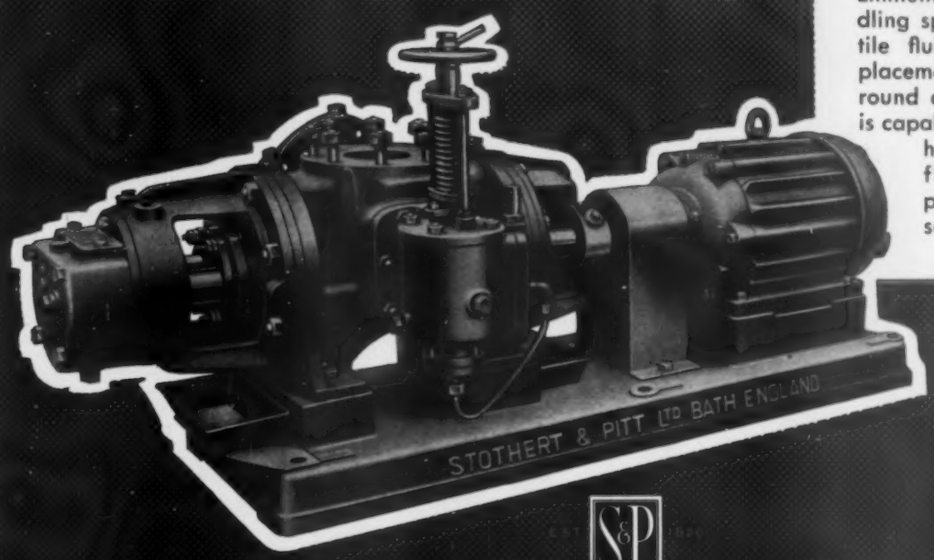

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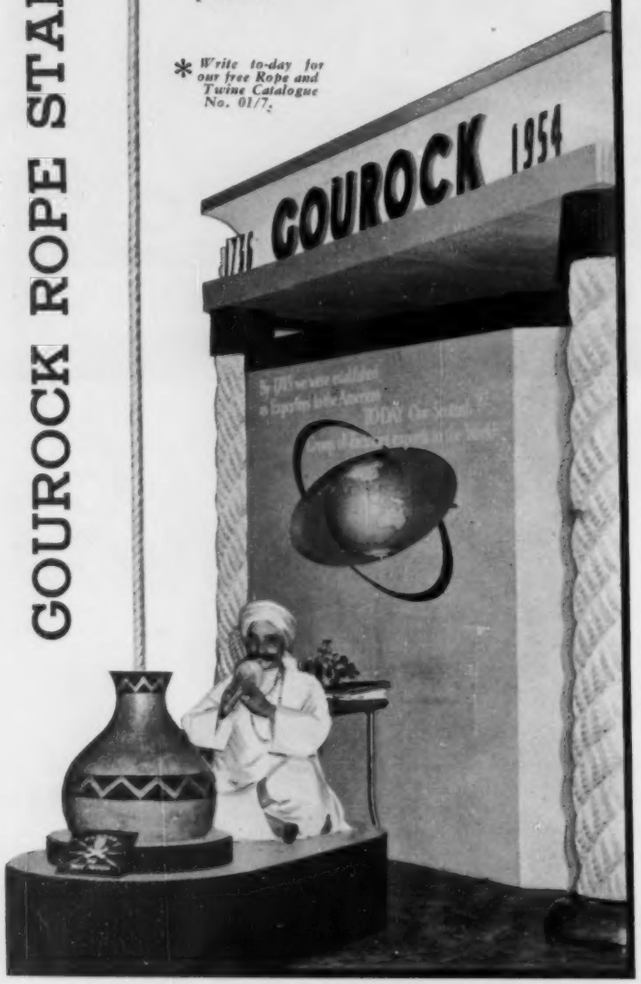

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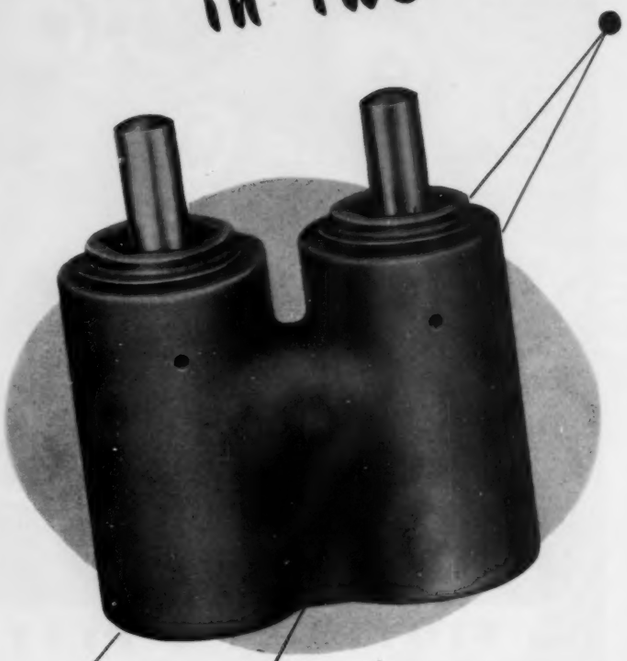

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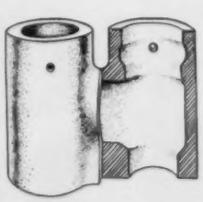
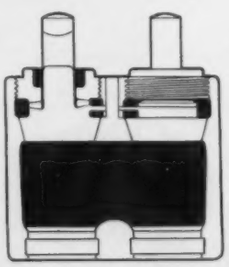
Type 1640 is recognised for its ability to withstand higher temperatures and pressure, and in common with all types of Osborn-Ohio fittings, can be depended upon to give first rate performance.

TYPE 1640



For strength at high pressure and temperatures. Detailed recommendations for particular conditions will gladly be given.



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Kuwait

(Continued from page 63)

square miles, lies between Saudi Arabia and Kuwait on the west side of the Persian Gulf with joint jurisdiction by rulers of the two countries, but no division of territory. Concessions are held by American Independent Oil Co. (Aminoil) and Pacific Western Oil Company, with exploration and production managed by Aminoil for joint account.

Exploration began in 1949 and the first five wells put down were dry holes. When operations were concentrated on the Wafra structure, the fourth well there was brought in as a producer in March 1953. Wafra oil was reported to be of 24° API gravity. Since then a development program has been carried on with production steadily increasing.

During 1953 storage tanks were erected, gathering lines were laid and a 10-inch pipe line 34 miles in length was run to a shipping terminal constructed in Kuwait to which the name Mina Abdulla has been given. The first cargo of crude to leave this port was shipped in January 1954.

While Aminoil's concession was derived from Kuwait, that of Pacific Western was obtained from Saudi Arabia. Objection by the latter to having shipments of its share of the oil leave from another country led to the building by Pacific Western of a second 10-inch pipe line from Wafra to a point on the Gulf within the Neutral Zone with a two-mile submarine extension to permit offshore loading of tankers. A terminal and camp was established at Khor al Mufatta to enable the company to ship its oil directly from the Neutral Zone.

At mid-year of 1954 it was reported that 15 wells were producing in the Wafra field with drilling proceeding and wells being positioned on a half-mile spacing. At that time production was said to be nearing 30,000 b/d. According to the program laid down in 1953, the number of wells to be drilled at Wafra will be 23, but this may be increased according to conditions. Exploration is being extended to a point further south where one of the earlier dry holes was drilled to about 9,000 feet, the hope being that deeper penetration may lead to a crude of higher gravity.

No exact estimate of the Neutral Zone potential is available, but known reserves are currently estimated at 300 million barrels.

Hungary

The Hungarian Geophysical Instruments Factory is manufacturing new type equipment and is planning serial production of smaller seismic apparatus modeled after the larger units.

Heads Equipment Suppliers Association

Rodney S. Durkee was elected president of the Petroleum Equipment Suppliers Association at the organization's 19th annual meeting, held at Murray Bay, Quebec, June 28-July 1. Mr. Durkee is president of Lane-Wells Co., Los Angeles.

Other newly-elected officers are: vice president, M. E. Montrose, Hughes Tool Co., Houston; treasurer, Wharton Weems; assistant treasurer, Leroy Jeffers, both of Vinson, Elkins, Weems & Searle, Houston; and executive secretary, H. R. Safford, Jr., Houston.

The following were elected to the executive committee: Eastern district, Lloyd N. Lanphere, Ajax Iron Works, Corry, Pa.; Mid-Continent and Rocky Mountain district, Rainey Elliott, Jones & Laughlin Steel Corp., Supply Division, Tulsa; Southwestern district, George O'Leary, Houston Oil Field Material Co., Inc., Houston; and Pacific district, Ott Hammer, Dresser Operations, Inc., Security Engineering Division, Whittier, Calif.

Trans-Canada Gas Line Progress

N. E. Tanner, president of Trans-Canada Pipe Lines Ltd., has announced that a newly-formed company, Bechtel-Mannix-Hester, will be in charge of design, engineering and construction of the 2,200-mile natural gas pipe line. The new company represents the pooling of resources and experience of three of the leading pipe line building organizations — Canadian Bechtel Ltd., Toronto; Mannix Ltd., Calgary; and Oklahoma Contracting Co., Dallas.

"Granting of the permit to Trans-Canada by the Transport Board is the signal we have been waiting for to get started on the Alberta-Montreal line," said Mr. Tanner. "Our contract with Bechtel-Mannix-Hester calls for completion of the project by the end of 1956. We will be selling natural gas in Saskatchewan, as far east as Winnipeg, and to the Minnesota area next fall, and service from the line will be available in Toronto and Montreal a year later."

While the actual laying of pipe on the line will not get started until next spring, surveying, right-of-way negotiations and clearance will be started immediately.

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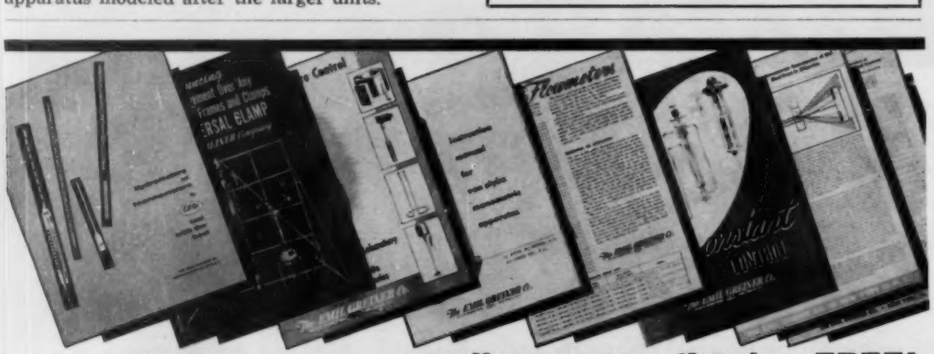

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..only part of the picture

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RECENT CONTRACTS **Among the large petroleum projects to which Newalls have supplied insulation materials recently are the Anglo Iranian Oil Company's new refineries at Aden and Kwinana and also the new Brazilian State Refinery at Cubatao, Brazil.**

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ADVERTISERS' INDEX

(Advertising Agencies in Italics)

Air Pumps Ltd. 115
Goddard Watts Ltd.

John Allen & Sons (Oxford) Ltd. 122
Howard Bull Advertising

Anglo-Iranian Oil Co. Ltd. 97
S. H. Benson Ltd.

Atlantic Refining Co. 19
N. W. Ayer & Son, Inc.

E. B. Badger & Sons Ltd. 133
Thames Adv. Service Ltd.
Harold Cabot & Co., Inc.

Barnes & Bell Ltd. 99

Bechtel Corporation 35
Ryder & Ingram Ltd.

Billington & Newton Ltd. 149

Bolton's Superheater & Pipeworks Ltd. 155
Donald MacDonald Adv't. Ltd.

British Ceca Co. Ltd. 136

British Ropes Ltd. 140
D. J. Keymer & Co. Ltd.

British Thomson-Houston Co. Ltd. 22
Technical & General Adv. Agency Ltd.

Brooke Industries Ltd. 150

Peter Brotherhood Ltd. 140
Rooster Publicity Ltd.

Brown Drilling Co. 148

Burton Delingpole & Co. Ltd. 33
S. H. Wright & Co. Ltd.

The Butterley Co. Ltd. 142
Rowlinson Broughton

California Texas Oil Co., Inc. 10
Erwin, Wasey & Co., Inc.

Canadian Parkhill Pipe Stringing Co. 152

The Cape Asbestos Co. Ltd. 117
Taylor Advertising Ltd.

Chicago Bridge & Iron Co. 1
Russell T. Gray, Inc.

Cities Service Company 34
Albert Frank-Guenther Law, Inc.

Climax Rock Drill & Engineering Co. Ltd. 114
Technical Advertising Service Ltd.

Collins Construction Co. 24

The Continental Supply Co. 45
Ruthrauff & Ryan, Inc.

Costain John Brown Ltd. 145
Stanley D. Dickson

Richard Costain Ltd. 112

Crane Company 6
The Buchen Company

Crane Packing Ltd. 143
Ruddock Advertising Ltd.
J. Ainsborough Everiss & Assoc.

Davey, Paxman & Co. Ltd. 110
Rooster Publicity Ltd.

Davison Chemical Corporation 27
St. Georges & Keyes, Inc.

Dikkers & Co. N. V. 25
Ir. J. Bauduin, Nederlands Reclame Adviesbureau

Dresser Industries, Inc. 38
Don L. Baxter, Inc.

Dunlop Rubber Co. (G.R.G. Overseas) Ltd. 164
Charles F. Higham Ltd.

E. I. du Pont de Nemours & Co., Inc. 17-18
Charles L. Rumrill & Co., Inc.

E. C. D. Ltd. 101
Samson Clark & Co. Ltd.

Ernst Water Column & Gage Co. 160

Flexible Drives (Gilmans) Ltd. 149
Boswell & Barratt Ltd.

Fluor Corporation 151
Dozier, Eastman & Co.

Foster Wheeler Corporation 129-130
Rickard & Co., Inc.

General American Transportation Corp. 128
Weiss & Geller, Inc.

General Electric Company of England Ltd. 28
Kingscott Ltd.

General Electric Company, International 5
Grant Advertising, Inc.

Geolograph Mechanical Well Logging Service 160
Lowe-Runkle Company

Geophysical Service, Inc. 29
Auld Advertising

The Gourock Ropework Co. Ltd. 158
Sommerville & Milne Ltd.

Graver Tank & Manufacturing Co., Inc. 8
The Buchen Company

The Emil Greiner Company 160
Fairfax, Inc.

J. P. Hall & Sons Ltd. 144
Rooster Publicity Ltd.

Halliburton Oil Well Cementing Co. 48
Hill & Christopher, Inc.

Hammond Iron Works 3
Sam J. Gallay Advertising

Hayward-Tyler & Co. Ltd. 119
Howards Publicity

Houdry Process Corporation 92
Arndt, Preston, Chapin, Lamb & Keen, Inc.

The Howe-Baker Corporation 147
Rives, Dyke & Co.

Hudson Engineering Corporation Cover III
Brennan Advertising Agency

International Harvester Export Co. 32
McCann-Erickson Corporation

International Paints Ltd. 36
Mayfair Advertising Ltd.

International Standard Electric Corp. 146
J. M. Mathes, Inc.

Irvington Steel & Iron Works 156
La Porte & Austin, Inc.

Robert Jenkins & Co. Ltd. 157
Wm. Hopwood & Co. Ltd.

Ketjen 154
Raedt en Baet

Richard Klinger Ltd. 109
S. H. Wright & Co. Ltd.

Lafarge Aluminous Cement Co. 103
Allardyce Palmer Ltd.

Lake & Elliot Ltd. 126
Ripley Preston & Co. Ltd.

Le Grand Sutcliff & Gell Ltd. 155
Kent & Sussex Advertising Service Ltd.

The Lummus Company 46
Sterling Advertising Agency, Inc.

McCullough Tool Company 2, 4
Raymond O. Perry Advertising

Arthur G. McKee & Company 153
Meermans, Inc.

Makin Drilling Company 144

Mannesmann Export GmbH. 37

Henry Meadows & Co. Ltd. 159
General Advertising Co. of London Ltd.

Middle East Engineering & Const. Co. Ltd. 145
Stanley D. Dickson

Murray & Tregurtha, Inc. 118
Roy Elliott Company

Newman Hender & Co. Ltd. 121

Newalls Insulation Co. Ltd. 161
Doig Advertising Ltd.

Newton Chambers & Co. Ltd. 123
Stanley D. Dickson

Oil Center Tool Company Cover IV
Rives, Dyke & Co.

Samuel Osborn & Co. Ltd. 158

E. Ospina-Racines, Publisher 160

Otis Pressure Control, Inc. 163
Dan Goodrich Advertising

The Ralph M. Parsons Co. 11
Dozier, Eastman & Co.

Petreco 23
John C. Fellows Co.

Philco Corp. (Govt. & Indust. Div.) 20-21
Julian G. Pollock Co.

Precision Radiation Instruments, Inc. 125
The McCarty Co.

D. & C. & Wm. Press Ltd. 120
Taylor Advertising Ltd.

Procon, Inc. 40-41
Marsteller, Gebhardt & Reed, Inc.

Pye Telecommunications Ltd. 135
Arks Publicity Ltd.

The Pyrene Co. Ltd. 139
Nelson Advertising Service Ltd.

Rogers Geophysical Co. 16
Rives, Dyke & Co.

Schlumberger Well Surveying Corp. 91
Rives, Dyke & Co.

Seismograph Service Ltd. 15
Watts, Payne Advertising, Inc.

Sydney Smith & Sons (Nottingham) Ltd. 14
S. H. Wright & Co. Ltd.

Socony-Vacuum Oil Co., Inc. 26
Compton Advertising, Inc.

South Durham Steel & Iron Co. Ltd. 127
Tully-Crabbe Ltd.

Southwestern Industrial Electronics Co. 9
Publication Service Company

Peter Spence & Sons Ltd. 107
Ripley, Preston & Co. Ltd.

Standard Oil Co. of New Jersey 105
McCann-Erickson Corporation

Standard Oil Co. of California 12
Batten, Barton, Durstine & Osborn, Inc.

Standard-Vacuum Oil Co. 7
Sam J. Gallay Advertising

Stewarts & Lloyds Ltd. 111
H. Raymond Morgan

Stothert & Pitt Ltd. 157

Sun Shipbuilding & Dry Dock Co. 44
Doremus-Eshleman Co.

John I. Thornycroft & Co. Ltd. 137

Tide Water Associated Oil Co. 141
Buchanan & Company, Inc.

Timken Roller Bearing Co. 31
Batten, Barton, Durstine & Osborn, Inc.

The United Steel Companies Ltd. 13
Rowlinson Broughton

Universal Oil Products Co. 42-43
Marsteller, Gebhardt & Reed, Inc.

Vokes Ltd. 131
Crane Publicity Ltd.

Warren Petroleum Corporation Cover II
Chapman Advertising Co.

G. & J. Weir Ltd. 134
Scottish Industrial Advertising

The White Motor Company 30
D'Arcy Advertising Company

Worthington Corporation 39
James Thomas Chirurg & Co.

Zwicky Ltd. 138
Scottish Industrial Adv.

First Half Earnings

Net income of 40 oil companies in the first half of 1954 increased seven percent over the same period last year. The first quarter increase was 12.3 percent and the second quarter increase only two percent over last year's corresponding quarters.

The 40 companies earned $1,115,212,000 in the first six months, compared with $1,041,837,000 a year ago. Of the 40 companies listed below, 17 reported lower earnings. Details by companies follow:

SIX MONTHS NET INCOME

	Thousands of Dollars		Per Share of Common	
	1954	1953	1954	1953
Amerada	$ 8,042	$ 7,962	$2.55	$2.53
Ashland	3,083	4,825	.42	.74
Atlantic	19,842	22,620	2.14	2.45
Anderson Prichard	1,804	1,874	2.21	2.31
Barber Oil	499	3,074	.66	4.07
Bishop Oil	88	96	.24	.26
Continental	21,900	20,000	2.24	2.05
Cities Service	23,528	28,385	6.05	7.30
Deep Rock	327	618	.68	1.38
Derby Oil	521	543	1.12	1.17
Gulf Oil Corp.	77,942	75,761	3.18	3.09
Houston	3,118	3,352	2.35	2.52
Imperial Oil Ltd.	26,089	20,005	.87	.67
Louisiana Land & Expl.	6,832	5,038	2.29	1.69
Lion Oil	6,067	5,246	1.96	1.70
Mid Continent	7,174	7,166	3.85	3.86
Middle States	1,228	1,180	.53	.51
Ohio Oil	19,493	20,400	2.97	3.11
Panhandle	504	394	.31	.25
Phillips	37,919	34,225	2.59	2.34
Pure Oil	14,016	11,297	3.27	2.51
Plymouth	3,350	4,559	1.39	1.89
Quaker State	1,024	967	1.24	1.04
Richfield	12,394	12,989	3.10	3.25
Shell Oil	65,525	50,644	3.52	2.82
Sinclair	36,515	30,279	2.96	2.49
Skelly Oil	14,184	13,723	2.46	2.38
Socony Vacuum	88,000	88,000	2.51	2.51
Std. of Calif.	104,044	91,374	3.63	3.19
Std. of Indiana	53,043	54,742	3.44	3.56
Std. of Kentucky	6,382	5,239	2.45	2.01
Std. of N. J.	293,000	268,000	4.84	4.42
Std. of Ohio	8,044	8,506	1.90	2.02
Sunray	11,523	13,979	1.04	1.29
Tidewater Assoc.	18,167	17,487	1.35	1.30
The Texas Co.	97,481	85,980	3.55	3.13
Texas Gulf Producing	2,911	1,789	2.39	1.62
Union Oil Co. of Cal.	17,688	17,807	2.59	2.61
Venezuela Pet. Co.	1,602	1,232	.40	.30
Wilcox Pet. Co.	309	480	1.10	1.71
Totals	$1,115,212	$1,041,837		

New Seismic Log Level Indicator

New Model LLI Log Level Indicator has been announced by Houston Technical Laboratories to aid in seismic "noise" analysis and pattern hole and multiple seismometer shooting. The calibrated, electronic voltage measuring and indicating instrument operates with any standard seismic system, receiving its input from the regular seismometer signals and furnishing output directly to the recording camera.

The Log Level Indicator is so named because its trace amplitude is proportional to the logarithm of the input signal. The LLI trace provides a calibrated indication of signal strength throughout the length of the seismograph record. The LLI trace also is completely independent of automatic gain control and other characteristics of the seismic amplifier, differing materially from AGC traces affected by amplifier characteristics.

A bulletin (S-302) is available from Houston Technical Laboratories, 2424 Branard, Houston 6, Texas.

New Safety Record

Continental Oil Co. has completed six years of operations without a fatality, it was announced today by J. S. Boylan, director of the company's safety division. The new Conoco record represents 115,769,842 man-hours worked without a fatality.

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RESEARCH and DEVELOPMENT engineers at Otis are never satisfied. Otis' wire line methods and sub-surface controls are the best in the Industry, and yet, even at this moment, additional research and development is under way at our plant and in the field. Nowhere in the Industry will you find an organization with such a perfectly balanced combination for specialized pressure control services.
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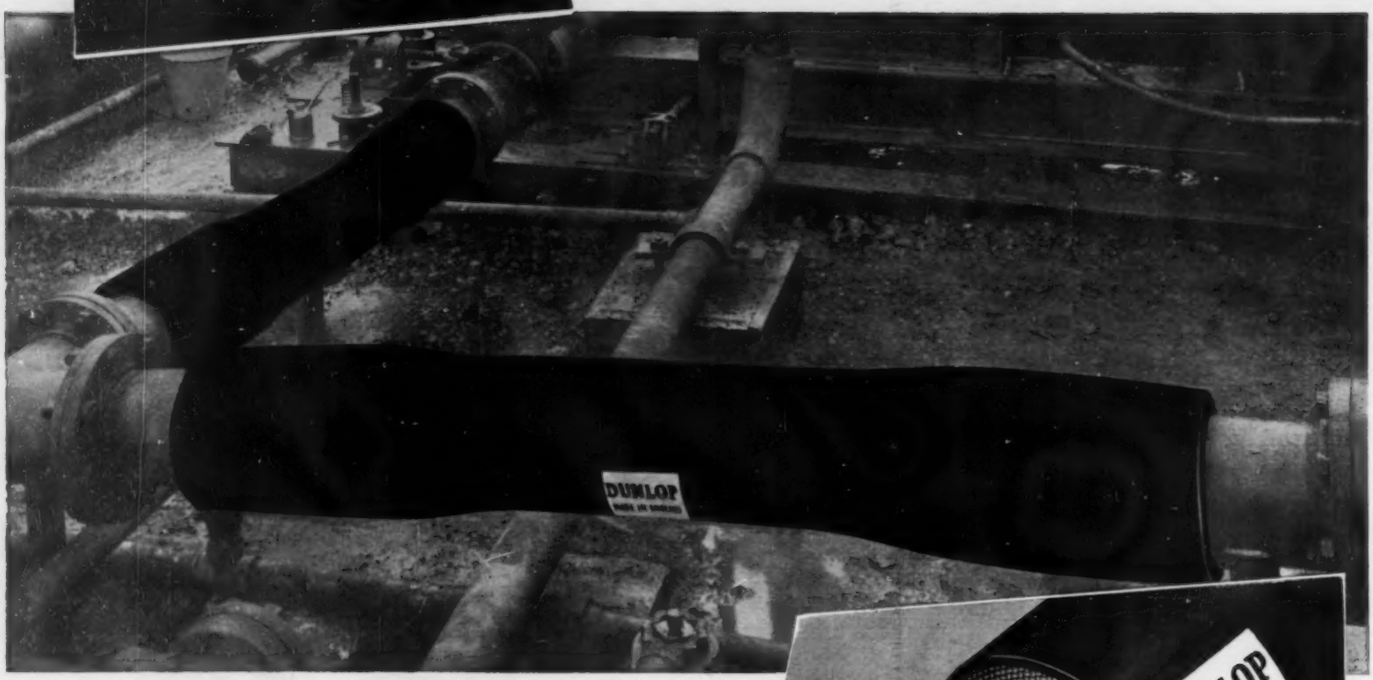

Yet another new drilling site—one of many throughout the world where Dunlop 428F Hose is proving its worth.
The Dunlop 428F is especially designed for the task to which it is to be applied and every inch is rigorously tested to ensure long and trouble-free life. Where the job is mud-suction, whether water-base or oil-base you can rely on Dunlop 428F. Where the project involves the use of rubber in any form, you can *always* rely on DUNLOP.

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3GRG/812

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COMBIN-AIRE units are in use for over 20 cooling services, operating on the humid Louisiana coast and the dry plains of West Texas and Oklahoma. Each unit has more than met its performance specifications.

The COMBIN-AIRE is a combination of a comparatively small Hudson water cooling tower with Hudson SOLO-AIRE hot fluid to air exchangers housed in one integral structure. In hot weather air to be used for cooling is reduced to near wet bulb temperature by contact with water near the bottom of the cooling tower. The cooled air is then used for cooling in the SOLO-AIRE units.

In cold weather the use of water is unnecessary. In the above photograph of the integrated structure the SOLO-AIRE units are in the upper foreground and the cooling tower portion is partially obscured in the background. In cold weather the shutters in the foreground may be opened to admit air directly to the SOLO-AIRE units.

Any one or more of the following proven advantages may dictate the use of COMBIN-AIRE for your next cooling problem.

1. **MINIMUM WATER REQUIRED.** No water used in cold weather. No loss from spray or carryover.
2. **NO WATER TREATMENT.** Hard water, sea water or water containing organic matter may be used.
3. **MINIMUM PIPING.** Absence of carryover or condensation allows installation adjacent to other equipment. Auxiliary shell and tube sub-coolers unnecessary.
4. **CLEAN AIR.** Air reaching Solo-aire units is free of dust, sand and insects.

The COMBIN-AIRE unit is protected by United States patents

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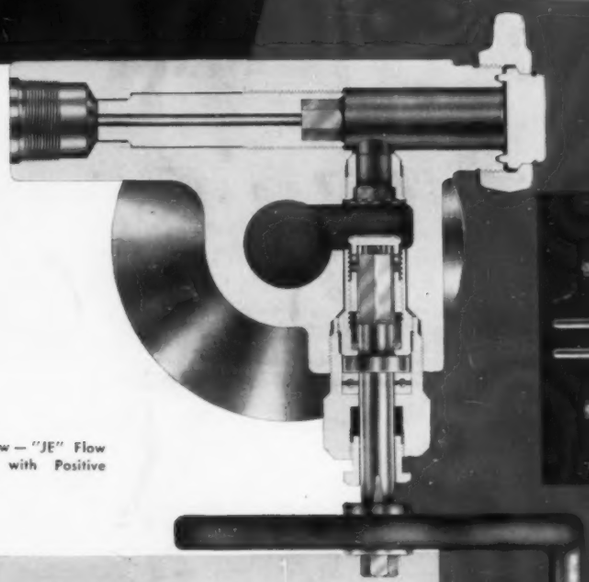
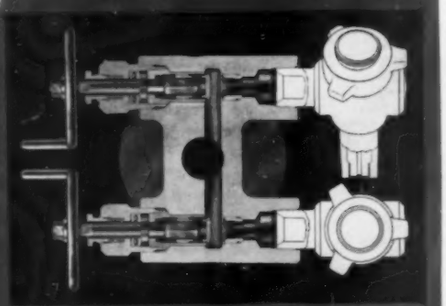
FLOW CONTROLS



Top View — "JE" Flow Control with Positive Choke.



The O-C-T Dual Flow Control is an outstanding companion to the "JE" Flow Control units which have gained universal acceptance in oilfields all over the world. This unit replaces 13 different fittings.

Since O-C-T introduced this compact, easy-operating "JE" Flow Control Unit in 1946, **more trees of all makes** have been topped from the master valve up with this unit than any other make. And there is good reason why O-C-T "JE" Flow Control Units are now on nearly 10,000 trees. ***It is the only flow control on the market that gives you the advantage of both a choke and a true valve type gate assembly and seating arrangement.*** The valve in your O-C-T Flow Control unit is a complete valve type gate assembly . . . with ball bearing construction to assure easy, quick operation. Specify O-C-T "JE" Flow Controls to your supply store. Use it to replace a tee or cross, wing valve, choke and bottom hole test adapter. Use it to save as much as $300.00 on every tree. Let your O-C-T representative show you the many other advantages that have made "JE" Flow Controls the most dependable product ever offered the oil industry. All O-C-T products are available through more than 700 supply store locations.

O-C-T makes the only flow control unit that gives you the advantage of both a choke . . . positive or adjustable . . . and a true valve type gate assembly in a single compact unit.

Oil Center Tool Co.

P. O. BOX 3091, HOUSTON, TEXAS

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